THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIV. No. 1646.] LONDON, NOVEMBER 27, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

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SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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Oxide Paints, Oils, and General Stores for Gas and Water Works.

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Special Quotations to Gas Companies.

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Quotations and Analysis on application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

Perfectly Steady and Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,

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CASH PREPAYMENT METERS.

THE "POSITIVE" PREPAYMENT SLOT METER.

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Material and Workmanship of the best.

Prices and full Particulars on application.

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PUMPS FOR GAS & WATER WORKS.

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TELEGRAMS: "EVANS WOLVERHAMPTON."

APPLY FOR CATALOGUE NO. 8.

TRADE MARK. LION

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Fig. 600. "CORNISH" STEAM-PUMP FOR WATER.

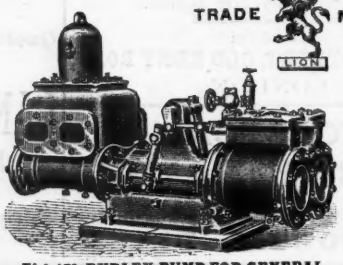

Fig. 670. DUPLEX PUMP FOR GENERAL PURPOSES.

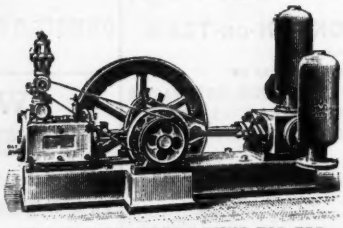

Fig. 683. "RELIABLE" PUMP FOR TAR AND THICK FLUIDS.

Fig. 709. SINGLE RAM PUMP FOR BOILER FEEDING, &c.

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WOLVERHAMPTON. LONDON OFFICE: 16, Union Court, Old Broad Street, E.C.

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OF EVERY KIND

FOR

GAS

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The "BRILLIANT."

The "IMPROVED CLARENCE."

APPLY FOR SPECIAL CATALOGUE (TO THE TRADE ONLY).

Manufactured by

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GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION

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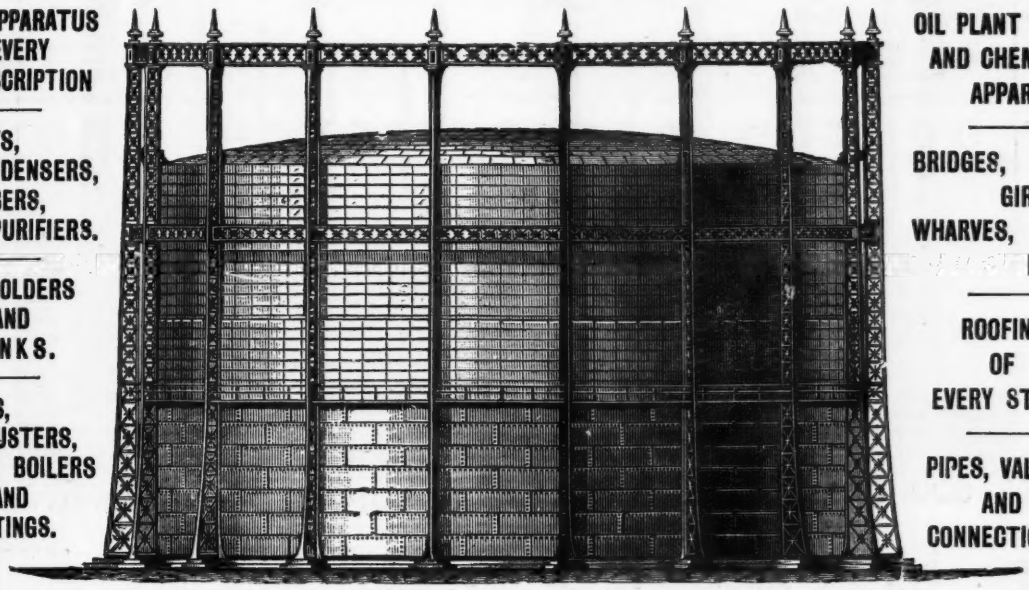

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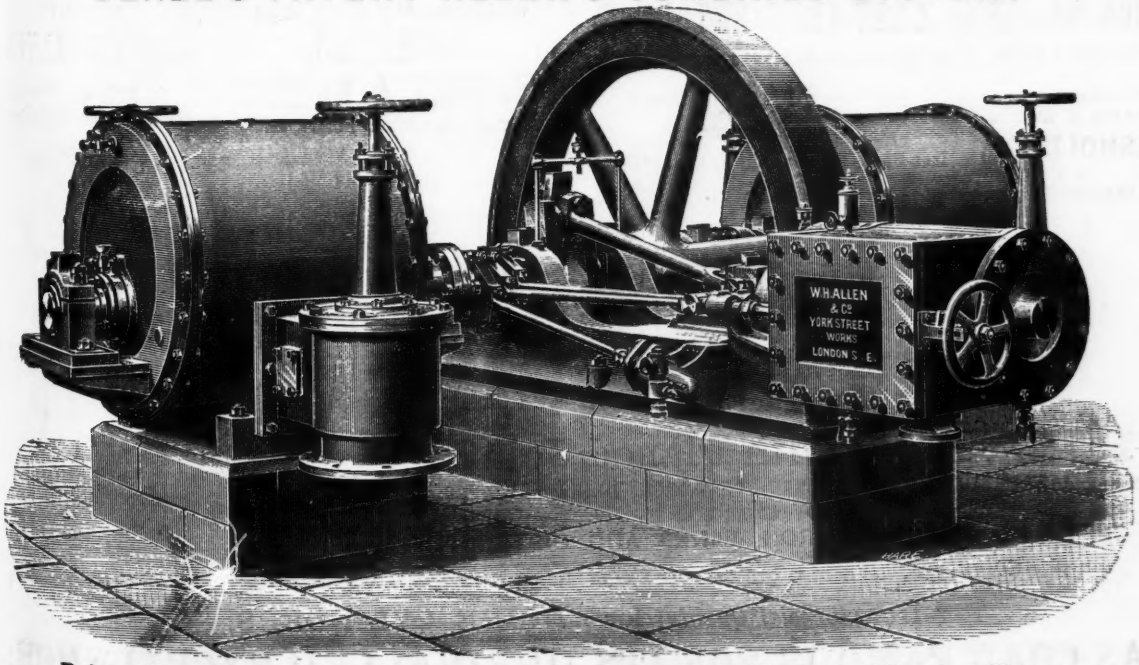
GAS EXHAUSTING MACHINERY

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



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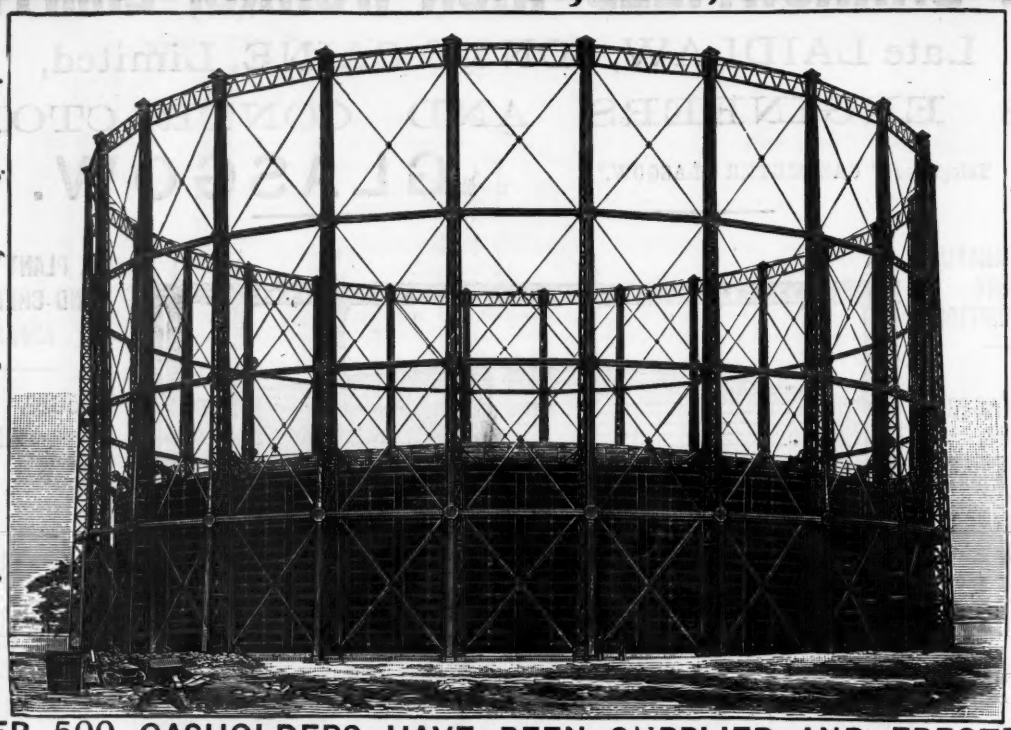

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AND
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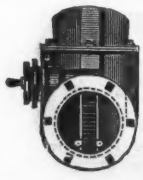

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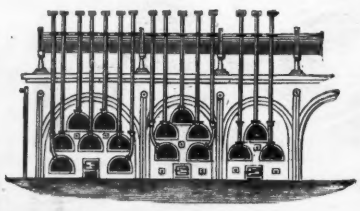

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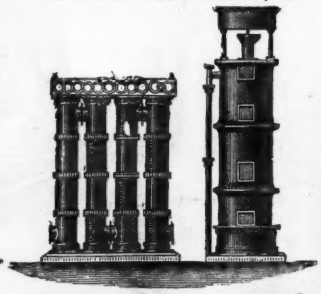

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for working Purifiers,
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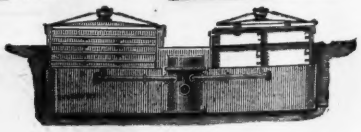

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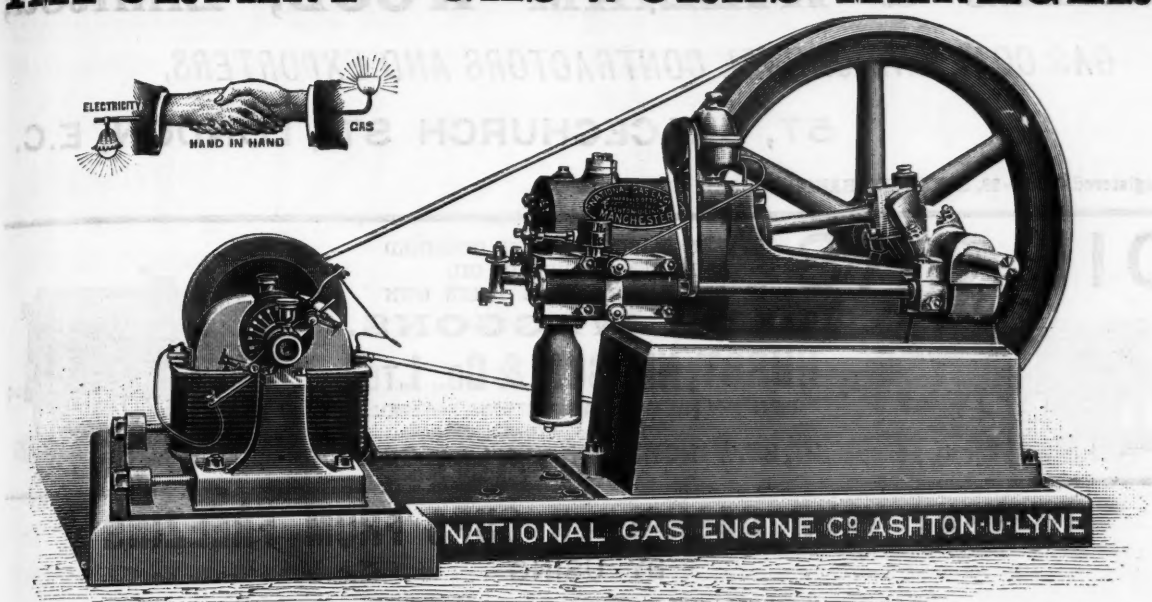

The fast growing tendency to adopt Electricity for lighting purposes should engage the attention of all thoughtful Gas Works Managers and those interested in Gas Companies.

By the aid of the Gas-Engine driving the Dynamo, **50 PER CENT. MORE LIGHT CAN BE OBTAINED FROM THE SAME GAS;** and thus, by their adoption as the motive power, the gas consumption of the district can be maintained and the light increased.

The **NATIONAL GAS-ENGINE** is specially constructed for this purpose, both for Small Installations for isolated places, and also for large Central Electric Light Station Work.

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GEORGE ORME & Co.

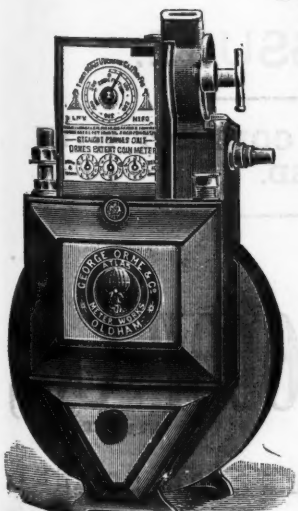
ATLAS METER WORKS, OLDHAM.

ORME'S PATENT COIN PREPAYMENT METERS

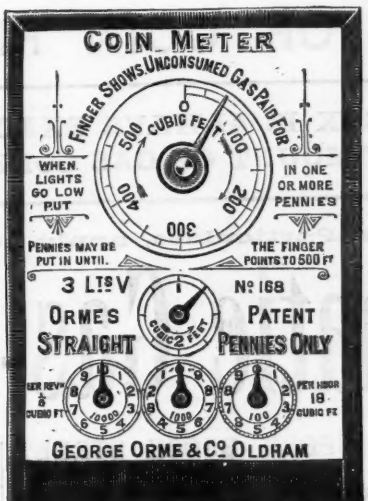
Wet Meters in Cast-Iron and Tinplate Cases. Dry Meters in Tinplate Cases.

NEW PATENTED ARRANGEMENT FOR ALTERING THE SELLING PRICE OF GAS.

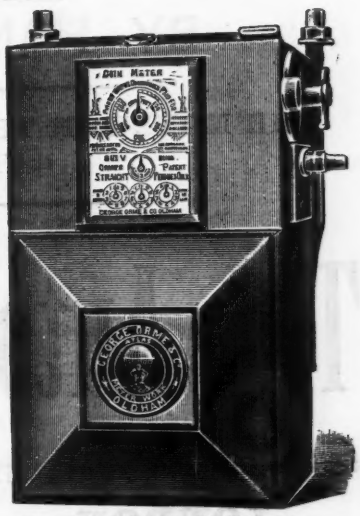
Full Particulars sent upon Application.



Wet Coin Meter in Tin-Plate Case.



Half-Size View of Dial of Coin Meter.



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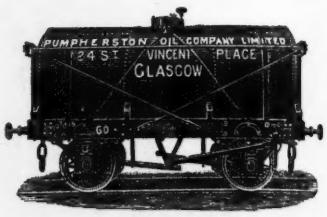

PREVENT YOUR GASHOLDER CUPS FROM FREEZING

BY USING

CLAYTON'S

IMPROVED ANTI-FREEZING APPARATUS

It is the CHEAPEST, SIMPLEST, and MOST EFFECTIVE in the Market.

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What is the Continuous?

IT IS A PREPAYMENT ATTACHMENT

THAT IS

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BY HAND OR COIN PRESSURE.

THE MONEY IN THE BOX IS ALWAYS EXACTLY CORRECT WITH THE AMOUNT OF GAS CONSUMED.

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London Office: 10, FINSBURY SQUARE.

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PURIFYING-MACHINES FOR AMMONIA.

CONDENSERS.

TAR PLANT.

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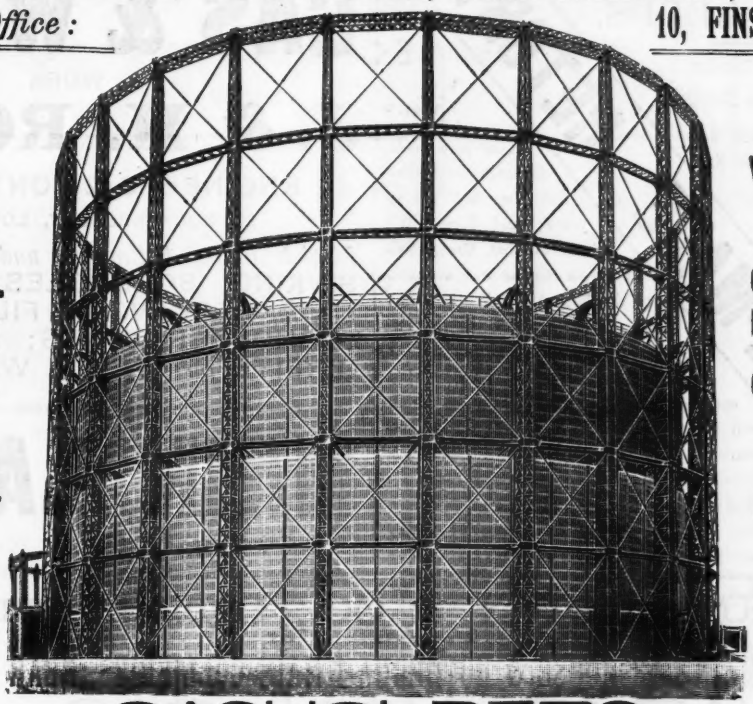


GASHOLDERS.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

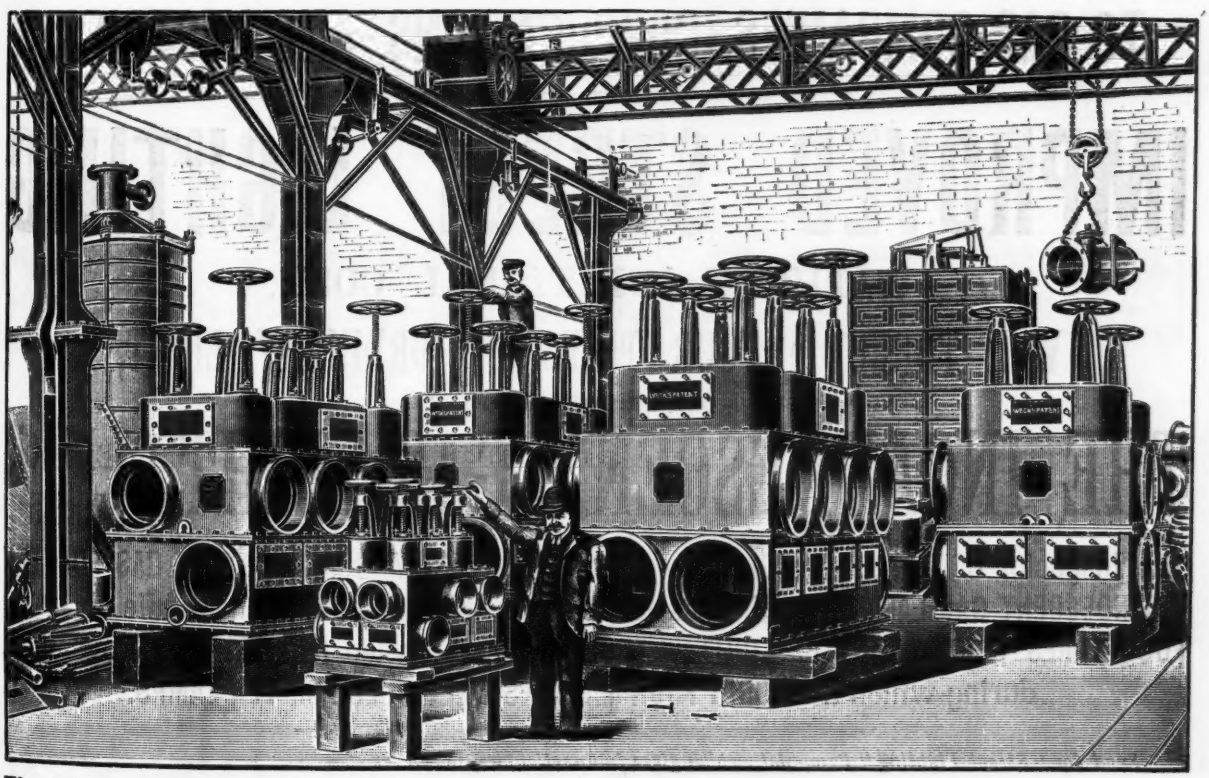
CRIPPS' HYDRAULIC MAIN VALVE.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892.

WECK'S PATENT CENTRE-VALVE.



The above is a copy of a Photo. of two out of Four 24-inch Eight-Way Valves for Belfast, one 24-inch Four-Way for Manchester, one 20-inch Eight-Way for Harrogate, one 6-inch Six-Way for Sheffield. These Valves were Photographed before being dispatched from our Works.

Sole Makers: C. & W. WALKER.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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WORK
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
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furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

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JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

TO GAS COMPANIES, CORPORATIONS, AND VESTRIES.

IMPROVED STREET LIGHTING
WITHOUT ADDITIONAL COST,
With THREE to FOUR TIMES the ORDINARY LIGHT,
CAN BE OBTAINED BY
THE INCANDESCENT GAS-LIGHT (Welsbach System)

The Inspector of Lighting in Glasgow reports that THE ANNUAL COST OF GAS FOR TEN INCANDESCENT GAS-LAMPS WAS £17, as against £39 with the old system, while obtaining FOUR TIMES THE AMOUNT OF LIGHT. The experiment lasted from May to November, during which time ONLY FOUR MANTLES WERE USED FOR TEN LAMPS.

Send for "Street Lighting" Pamphlet, which gives full particulars, to

THE INCANDESCENT GAS-LIGHT COMPANY
LIMITED,
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SEND FOR PRICE LISTS OF

BRAY'S

PATENT FLAT-FLAME LANTERNS,

From 30 to 1100 Candle Power.

THEY ARE SUITABLE FOR GAS OF EVERY CANDLE POWER,

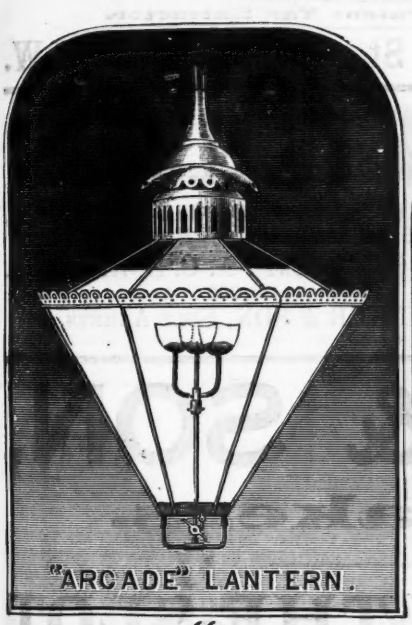
MADE ENTIRELY OF COPPER.

THE "BRAY" REFLECTING LIGHT

Is an unequalled combination of SIMPLICITY, CHEAPNESS, and EFFICIENCY.

GIVES REMARKABLE LIGHTING VALUE FOR GAS CONSUMED.

SEND FOR PRICES AND PARTICULARS.


"ARCADE" LANTERN.

"STREET" LANTERN.

BRAY'S "SPECIAL" AND "ADJUSTABLE" BURNERS

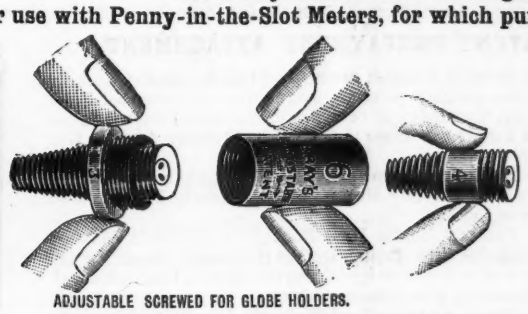
Are the best in the Market for general use, and are very moderate in price.

It is not unusual to see the ordinary Burner yielding less than half the light that Bray's "Specials" and "Adjustables" would yield with the same consumption of Gas.

Gas Managers should try them on Consumers' Fittings; and they would see at once how to compete more effectively with the Electric Light.

Specially adapted for use with Penny-in-the-Slot Meters, for which purpose large quantities have been sold.

SCREWED FOR GLOBE HOLDERS. UNION JET.


ADJUSTABLE SCREWED FOR GLOBE HOLDERS.

ADJUSTABLE.

BATSWING. SLIT-UNION.

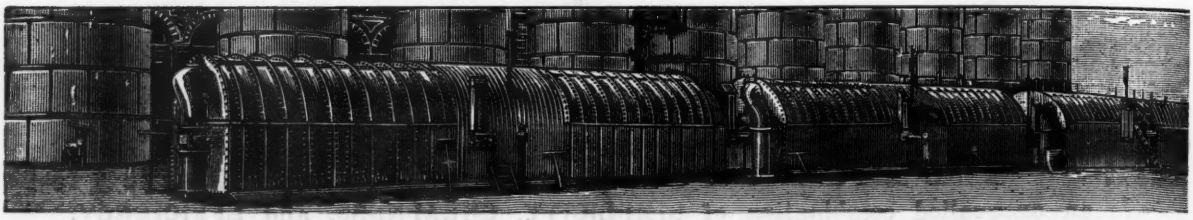
SEND FOR PRICES AND PARTICULARS.

GEO. BRAY & CO., GAS LIGHTING ENGINEERS, LEEDS.

KIRKHAM, HULETT, & CHANDLER, LD.

PATENT "STANDARD" WASHER-SCRUBBER

☛ **484** of these Machines (capable of dealing with **464,490,000** cubic feet of Gas daily) in use, which fact is given as evidence of this apparatus being the Most Efficient of any in the Market for the extraction of Ammonia, Carbonic Acid, and Sulphuretted Hydrogen from Coal Gas.



View of SIX PATENT "STANDARD" WASHER-SCRUBBERS, erected at the Backton Station of The Gaslight and Coke Company (the Engines driving same being under Galvanized Iron Covers). This Company have **30** of these Machines in use. They are also in operation at a great number of Gas and other Works in this Country and Abroad.

Sole Agents in Great Britain for Marshall's Patent Tar Extractor.

Address: 3 & 4, Palace Chambers, Bridge St., Westminster, S.W.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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Gas-Meter Makers.

PATENT PENNY-IN-THE-SLOT

WET AND DRY

PREPAYMENT GAS-METERS.

WET METER.

Advantages claimed for our

PATENT PREPAYMENT ATTACHMENT.

1st—It is the most compact arrangement in the market.
2nd—All the working parts are mounted on a strong cast Brass Frame, the front end of which carries an additional Index and Pointer to show the number of cubic feet of Gas prepaid.
3rd—The whole attachment can be easily adapted to the ordinary Wet and Dry Meters, without interfering with any existing parts.
4th—The Patent Circular Feed Rack gives a POSITIVE quantity of Gas for each Penny, so that the money found in the cash-box will always agree with the value of Gas consumed, as shown by the ordinary index.
5th—The Patent Circular Feed Rack can be adjusted *in situ* to suit changes made in the price of Gas.

DRY METER.

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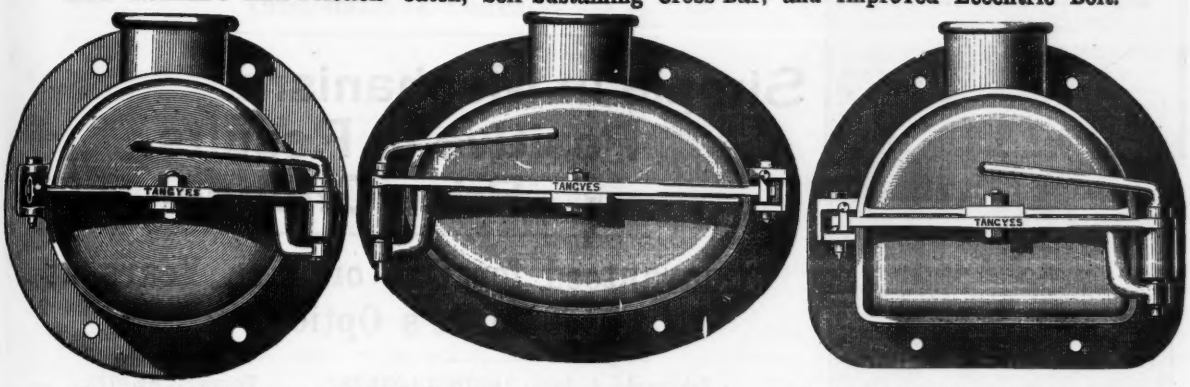

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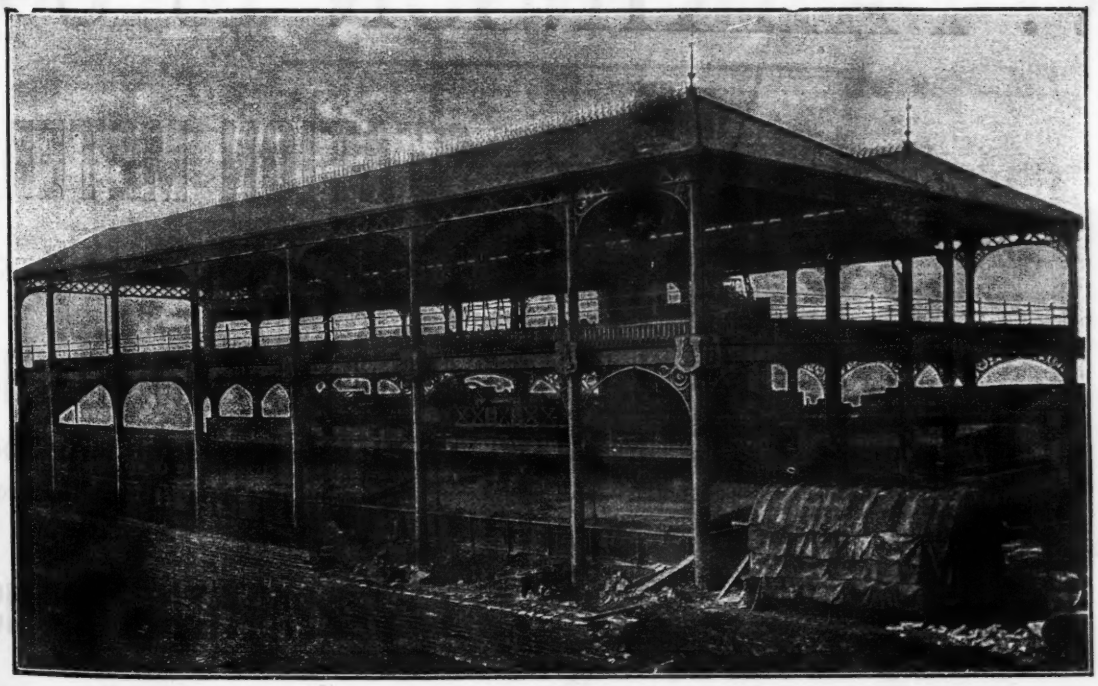

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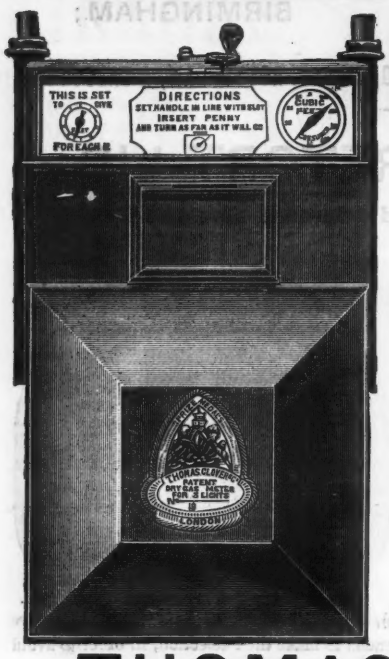

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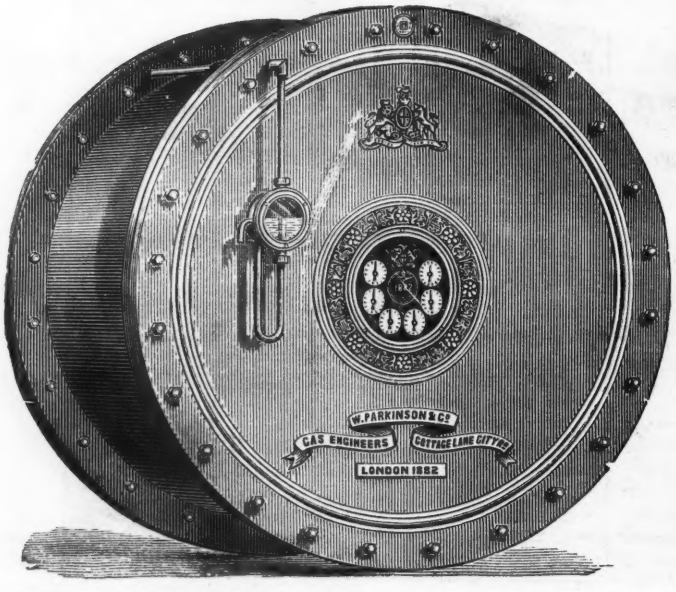

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 27, 1894.

The Metric System and Gas Supply.

A SPECIAL general meeting of the New Decimal Association was held last Tuesday, at the London Chamber of Commerce, under the presidency of Sir Samuel Montagu, for the purpose of showing the progress made by the movement, and to ask for advice and support. A number of well-known men connected with the sciences, arts, and industries of the country were present; and it was resolved, on the motion of Sir Albert K. Rollit, "that this Association learns with satisfaction that the Government consents to the appointment of a Select Committee to inquire whether any and what changes in the present system of weights and measures should be adopted; and the Executive Committee is hereby authorized to take such steps as it may consider best for promoting the adoption of the metric weights and measures." The ground has been cleared to a great extent of theoretical entanglements and practical objections since the desirability of making this change was first vainly argued before English industrial and commercial opinion. It is idle to shut one's eyes to the fact that the only system of weights and measures that can be truly called international, and that grows in public favour, is the metric system. All attempts made to decimalize our English weights and measures have failed; and if any otherwise acceptable device of the kind were to appear to-morrow, it would not arouse the slightest interest in the minds of men of business. The only possible alternative to our own Imperial system of weights and measures is the metric; and we are urged to abandon the one and adopt the other, not because the former is altogether bad and the latter altogether good, but for the practical reason that our foreign trade with 400 millions of people, taking 60 or 70 per cent. of it, had better be carried on by it. It is in their favour that the New Decimal Association do not overload their programme by including in it the reform of the British currency system; for this chiefly concerns ourselves. But our weights and measures ought to be made to suit our customers, if trade is not to be hampered.

Most of us would be sorry to see the old familiar and convenient Imperial units relegated to the realm of the obsolete. It was a great pity the French framers of the metric system did not take our pound avoirdupois—really, as the name shows, a unit of French, or rather Norman origin—instead of the kilogramme, which is too much for the requirements of the smaller commerce, and has no particular advantages for the larger. If it is to come, however, the metric *tonne* is, after all, very little different from our own ton. Consequently, in gas making at any rate, the change of systems would not be greatly felt in this regard; and people would soon get used to doing their marketing in kilos. The idea of the British foot-rule being superseded by the unwieldy metre stick or tape is, it must be confessed, very unpleasant to most men who have ever carried the former. Gas makers, however, would have the consolation of selling their staple product by the cubic metre, at prices reckoned in a few pence; and this would make the popularization of gas easier than ever to effect. A cubic metre of gas is about 35·3 cubic feet—a quantity which unfortunately is not a factor of 100 cubic feet, in which case we should have liked it all the better. Still, as we have often admitted in these columns, the English customary unit for the sale of gas is too large for the smaller commerce; and the cubic metre would be more popular and more easily grasped by users of small quantities. It is rather more than any gas undertaking yet sells as a pennyworth by means of an automatic prepayment meter; but, so far as has been gathered from experience, the people who are served by this system do not care what quantity of gas they get for a penny, so long as it is a pennyworth. It is only fair to admit that gas managers who have worked by it on the Continent or elsewhere generally like the metric system on account of its simple arithmetic.

Mr. George Livesey on the Municipalization of the London Gas Companies' Undertakings.

THE new number of the "Liberty Review Yearly"—a copy of which has just been sent to us by the courtesy of the Editor, Mr. Frederick Millar—contains, among several instructive articles, a contribution by Mr. George Livesey, asking the important question: "Should London Gas Companies be Municipalized?" The question does not at present belong to the realm of "practical politics;" but there is no knowing how long it may be before somebody will endeavour to make it a "burning" one. Consequently, there is no harm in Mr. Livesey's putting upon record some of the elementary considerations which enter into the subject of municipalized gas supply in general, and of the gas supply of London in particular. As we have always admitted, and as Mr. Livesey concedes most fully, the question is entirely one of expediency in regard to the public service. He says upon this head: "If the "public who require gas *can and will* be better served by a "public authority than by a company, then purchase on "fair terms can be justified; but it will be very necessary "to make such binding regulations as will ensure to the "gas consumers fair and honest treatment." It is noted as a singular fact that, whereas the first and chief consideration should be the interest of the consumers of gas, "in England the advocates of a transfer almost invariably ignore the consumers altogether, and put forward "the supposed advantage to the ratepayers, who, out of "surplus profits . . . are to obtain a large annual "subsidy in aid of the rates." Mr. Livesey shows that surplus profits are not permitted to gas companies; and he opines that if the same restriction were put upon municipalities, not many of them would run after gas property.

Leaflets have been issued by certain parties connected with Municipal London, giving glowing pictures of what might be done in aid of the rates out of appropriated gas profits, but upon the assumption, as Mr. Livesey says, that the property of the Companies can be purchased at about half its value. As to provincial examples cited to show that rates can be reduced by 6d. in the pound, or thereabouts, out of gas profits, Mr. Livesey roundly states that, in order to do this, "the gas consumers are in some "cases charged as much as from 4d. to 5d. per 1000 cubic "feet more than is necessary to pay all legitimate charges "for interest and sinking fund, maintenance of works, and "manufacture of gas. Fourpence per 1000 cubic feet on "the gas supplied by the three London Gas Companies "is equal to half a million a year out of the consumers' "pockets." Mr. Livesey makes a strong point of the fact that the lowest gas prices in the kingdom are those of Companies; and he puts the comparison in a nutshell by showing that, whereas it is the object of Municipalities to charge as high a price for gas as they dare, that of Companies is to make the figure as low as they can. The article is as trenchant and full of strong matter as most of the author's controversial writings.

The Inquiry into the Cannon Street Accident.

THE evidence laid before Major Cardew in respect of the accident in Cannon Street, when a horse was killed by electric shock, and a couple of explosions in neighbouring electric cable junction-boxes did some damage and caused much alarm, will be found fully reported in another column. Happily, besides the slaughter of the horse, no other serious injury to life or property resulted from this alarming occurrence; but it might very easily have been otherwise, as the public naturally feel. There was no question as to what killed the horse and gave an unpleasant shock to the driver and several persons who happened to be passing at the time; but there is a conflict of desire, if not of evidence, to make out what caused the explosions and the flash of fire which was seen to accompany them. The City of London Electric Lighting Company cannot deny that electricity killed the horse and shook the human sufferers by the accident; but they have tried to bring in The Gaslight and Coke Company as at least partly responsible for the explosions, which they alleged were due to gas. If this had been the case, and gas had accumulated in dangerous quantity in one or both of the junction-boxes for the electric cables, the question of what set it alight would remain; and the responsibility for not keeping gas out of their conduits would still rest upon the Electric Lighting Company. There is distinct evidence, however, that the explosions were not due to gas; and all the observed phenomena may be accounted for without any reference to The Gaslight and Coke Company or their works. So far as the strict legal bearings of the event go, the Company might have held aloof from the inquiry; but, as a matter of respect to the Board of Trade and the Inspector, and with a view to reassuring the public as to the groundlessness of the charge made against gas, Mr. G. F. L. Foulger attended it uninvited, for the purpose of denying the electricians' imputations. Mr. Foulger's statements were perfectly clear and conclusive as to the absence of escaped gas from the junction-boxes and the vicinity of the explosion generally. He was able to lend material assistance to the Inspector; and he testified, on behalf of the Gas Company, to the friendliness of the relations that have hitherto existed between the two Companies. Asked whether The Gaslight and Coke Company would assist the Electric Lighting Company and the Board of Trade in arriving at a thoroughly satisfactory solution of the distribution question, Mr. Foulger answered with a ready and emphatic affirmative; adding: "We are quite as interested as the Electric "Company in preserving the public safety." This is so; and the Gas Company are to be congratulated upon their wisdom in proclaiming in the plainest way their desire to co-operate with the Electric Company in taking measures for ensuring the public security. People are frightened badly enough as it is over these electric cable accidents; and if it were suspected that there was any lack of agreement in regard to the taking of mutual precautions between the supplies of gas and electricity, there would be a panic in the City. After the evidence given at the inquiry, it is a gratuitous confusion of the issue to pretend, as some of the London newspapers have done, that the unaccounted-for portion of The Gaslight and Coke Company's output of gas has anything to do with the Cannon Street accident. It is a striking coincidence, by the way, that this same topic of unaccounted-for gas should have cropped up again in our columns just at this particular juncture. If there is unaccounted-for gas, moreover, there is also unaccounted-for electricity; and it would be just as sensible to drag one quantity as the other into comments upon an occurrence which can easily be accounted for by other considerations.

Parliamentary Notice by the South Metropolitan Gas Company.

THE South Metropolitan Gas Company have given the necessary notice of their intention to go to Parliament next session for permission to make certain important alterations in their capital and administrative arrangements. The proposed Bill will contain practically but two provisions—one for consolidating all the Company's stocks, and converting them into an equivalent amount of a 5 per cent. stock; and the other for facilitating the appointment of workmen-shareholder Directors, if such a step should appear desirable. There is nothing of a contentious nature in either of these proposals. The capital consolidation project is the natural outcome of the Crystal Palace District and the Bristol Companies' success with a similar scheme; and there is no reason to expect that any opposition will be made to it in this case. With regard to the other matter, opinion respecting it will be moulded entirely by the nature of the conditions under which it is to be effected, if at all. Upon the face of it, we see no fundamental objection to what is apparently nothing more than a ratification, as well as a completion, of the movement which has been in progress for years in the direction of uniting the interests of employers and employed in this great undertaking. We shall reserve further comment upon the subject until we have been put in possession of the Company's complete plans in this regard.

The Meeting of the Manchester Institution.

THE Manchester District Institution of Gas Engineers met in Manchester on Saturday last, under the presidency of Mr. J. Braddock, of Radcliffe. It is a coincidence worthy of remark that this was the one hundredth quarterly meeting of the Institution; and the six new members admitted on Saturday made the total membership exactly one hundred also. Let us hope this was an augury for the long continuance in usefulness of the organization which has so far approved itself an indispensable agency for promoting good-fellowship among the large number of gas managers in the Manchester district. Saturday's meeting was not largely attended; and the proceedings, which included the election of Mr. G. Smedley, of Buxton, to the chair for the ensuing year, were unexpectedly brief. Mr. A. T. Fletcher read a paper on the working of inclined retorts at the Leigh Gas-Works; and Mr. Chester's paper on the use of gas for warming greenhouses was read in the author's unavoidable absence. There was a brief discussion; and the members afterwards took tea together as usual. The third paper on the *agenda*, in the name of Mr. R. Porter, of Elland, was withdrawn in consequence of the illness of the author. The text of the two papers and an abstract report of the general proceedings of the meeting will be found in another part of our present issue.

A Danger of Modern Gasholder Practice.

IT is to be hoped that our last week's article upon the new danger that has arisen in connection with insufficiently considered schemes of gasholder and tank construction will not escape the attention of those whom it may concern. The letter which appears in our "Correspondence" column to-day is welcome as a justification of our own action in giving the note of warning; and we thoroughly agree with our correspondent in his deprecation of the improper use of formulæ and tables of strains by persons of imperfect technical education, which is indeed almost worse than the absence of all attempts at computation, on the principle that "a little knowledge is a dangerous thing." What we meant by certain references in our article was merely to point out how easily information may be gleaned to show the necessity that exists for the proper proportioning of parts of structures. Nothing that imperfectly trained persons engaged in and about gas-works may gather from text-books or hand-books, can teach them how to use such information aright, any more than perusal of the medical and legal hints to be picked up from

newspapers and books will suffice to make the reader a physician or a lawyer. The information may be perfectly reliable; but there must be skill shown in its application. A strong passage in support of this caution occurs in a recent essay by Professor Gaetano Lanza, of the Massachusetts Institute of Technology. If a prospective engineer is "to be fit to assume responsibility at some "portion of his career before he allows himself to "use a formula in practice he ought to know just "how it is deduced, and what are the assumptions "that were made in deducing it." For the lack of this competency of knowledge, the would-be engineer, as Lanza says, "allows himself to risk the money, the safety, and "the lives of his fellow-men by making use of constants "and mathematical formulæ found in some hand-book or "elsewhere, using these constants and formulæ blindly, "without knowing how they were deduced, or whether "they have any reasonable foundation to stand on; or, in "other cases, merely guessing at what should be the "dimensions of the various parts of a structure." The complaint is an old one; but the warning is always needed. There are plenty of capable and trustworthy professional men who might be called in to advise as to the design of gasholders and other important structures required in gas making; and it is no disparagement of the average gas manager, who wants a new construction of the kind only once in ten years or so, to urge him always to avail himself of special assistance in connection with the designing of exceptional works.

The Chairmanship of the Colonial Gas Association, Limited.—Mr. S. Spencer, of Great St. Thomas Apostle, E.C., has been appointed Chairman of the above Association, in succession to the late Mr. H. L. Hammack.

Mr. John West, who was a candidate for election on the Manchester School Board, was returned with 57,000 votes; being the second highest on the list of fifteen members. The candidate at the top of the poll and the one standing third are, like Mr. West, new members; and they all join in the Church interest.

Society of Engineers.—The Council of this Society have unanimously elected Mr. S. Herbert Cox as one of the Vice-Presidents, in place of Mr. Henry Faija deceased, and Messrs. Henry O'Connor and William Bradford as members of Council. The annual dinner of the Sooiety is to be held at the Holborn Restaurant on the 12th prox.

Mr. Edward T. E. Besley, one of the recently-made Queen's Counsel, whose name is familiar to most readers of the JOURNAL in connection with legal proceedings reported from time to time therein, is largely interested in gas and water supply. He is a Director of the European Gas and Lambeth Water Companies; and as a shareholder in the Crystal Palace District Gas Company, he has been a familiar figure at their half-yearly meetings.

Presentation to Mr. F. J. Baynes.—Last Wednesday evening, the employees of the Ystrad Gas and Water Company, together with friends of Mr. F. J. Baynes, the late General Manager, met at the offices to take leave of Mr. Baynes previous to his departure from the Rhondda; he having been advised, as already mentioned in the JOURNAL, to pass the winter in a warmer climate. Advantage was taken of the gathering to present Mr. Baynes with a purse of gold as a small token of esteem, and in recognition of his services to the locality. The Rev. W. Lewis, the Vicar of Ystradyfodwg, who presided, alluded to Mr. Baynes's affliction, and wished him a speedy recovery. The presentation was then made by Mr. E. H. Davies, J.P., who referred in eulogistic terms to the sterling qualities of the recipient. Mr. Baynes feelingly responded. Votes of thanks to the Vicar, to Mr. E. H. Davies (Treasurer), and to Mr. W. Lambourne (Secretary) closed the proceedings.

Death of Mr. J. Lupton.—We regret to record the death, last Sunday week, in his 66th year, of Mr. James Lupton, Secretary and General Superintendent of the Gas Department of the Leeds Corporation. Mr. Lupton was formerly Secretary to the Leeds Gaslight Company, and remained in the service of the Company for twenty years. In 1870, when the undertaking was purchased by the Corporation, Mr. Lupton was engaged by them in the same capacity; and for a number of years he combined with his duties those of General Superintendent of the Gas Department. He was courteous and obliging to all with whom he was brought into contact; and he enjoyed the full confidence of the Committee under whom he acted. For some time before his death Mr. Lupton had not been in robust health; but he was in the Town Hall on the 12th inst., when the various Committees of the Council met to appoint their Chairmen, and, although apparently somewhat feeble, no one who then conversed with him could have imagined that his end was near. At the meeting of the Works Sub-Committee of the Gas Committee on Monday last week, reference was made to the loss they had sustained by Mr. Lupton's death; and a vote of condolence with his family was passed.

WATER AND SANITARY AFFAIRS.

THE terms on which the London County Council propose to acquire the undertakings of the Water Companies are now, to a certain extent, divulged by the usual statutory notices for bringing the requisite Bills into Parliament. As we have previously intimated, there is to be a separate Bill for each of the eight Companies. The notices occupied five columns of *The Times* on Tuesday last; and the demonstration will be repeated to-day. One advertisement is very much like another; the most obvious exception being in respect to the Chelsea Company, the district supplied being in that case wholly within the Metropolitan area, whereas all the other Companies carry their supply outside the bounds of what is now called the Administrative County—the total excess being 392 out of a total of 519 square miles, according to General Scott's estimate in 1889. In the case of each of the seven Companies thus travelling outside, the Bill is to provide for the sale or transfer of some part of the works and rights, when acquired by the London County Council, to other County Councils and Local Authorities. The supply of water in bulk is also provided for. Common to all eight Companies are two other provisions very much of the same character in respect to parting with a portion of the undertaking; but in the case of the Chelsea Company nothing is said as to the supply of water in bulk. However, the most serious part of the business is that which relates to the acquisition of the several undertakings in the first instance. If a purchase cannot be effected by agreement, recourse is to be had to arbitration. But the conditions attached to the arbitration are altogether extraordinary. They are the same for each Company, and occupy nearly forty lines of each notice. The Arbitrators are to have regard to all manner of events and contingencies—past, present, and future—which may be supposed to detract from the value of the undertakings, while "no allowance" is to be made for anything which tends the other way. There is to be an entire disregard of "any assumed future increase" in the rateable value of the buildings to which the water is laid on, and—what is more marvellous still—there is to be no allowance "in respect of any past increase in rateable "value," except as connected with an augmentation of the supply of water. How far the retrospect is to extend does not appear. The attention of the Arbitrators is to be directed to the legal powers of the Company to take water, and the probability of such powers being limited. Account is also to be taken of the rights of any other Company or body to supply water within the district, as well as the "probable necessity" of the introduction of a new source of supply. Deductions may be made in respect of works which have become "wholly or partially useless."

Such are some of the conditions laid down, under which the Arbitrators are to arrive at a conclusion as to the amount of consideration for which the Water Companies would have to surrender their property. Supposing all this clipping and carving to take place, the question is: How much will be left? What kind of arbitration can this be called, which sets out under restrictions of such a nature that it is difficult to see where any compensation is to come in? All that can be left will be the mere germ of the underteking. There is to be no addition to the purchase price in respect of compulsory sale. Neither is there to be any allowance on account of back dividends, or any recognition of a right to make up deficiencies in the dividends of the past. The notices specify that the Bills are to effect a "transfer" of the undertakings. The transaction now contemplated by the County Council is assuredly anything but a fair and reasonable purchase. The proper title in each case is that of an Appropriation Bill, if indeed a stronger term would not be more applicable. The ratepayer may take note of the fact that any deficiency in the revenue of the water undertakings, after these have been transferred to the Council, will become a charge upon the county rate.

It is a rule for statutory notices to cast the net as wide as possible; but the "transfer" Bills of the County Council relative to the Water Companies have so outrageous an aspect as to rob the scheme of the weight which otherwise might attach to it. The subject was referred to at the meeting of the West Middlesex Water Company last week; the Chairman (Sir W. H. Wyatt) remarking that

Parliament was not at all likely to pass such a Bill, neither would any of the Companies willingly agree to the proposals so put forward. The conditions laid down were of such a nature that he pronounced them to be unjust, and even iniquitous. A further consideration consists in the fact that a scandalous waste of money is thus brought about. The County Council will be lavish at the expense of the ratepayers; and the Companies will have to resist the attack to which they will be subjected. What this means appears in the case of the West Middlesex Company, who were driven by the County Council in the past session to an outlay exceeding £3000 in promoting a Bill which in the end passed through Parliament without any material alteration.

The Commissioners of Sewers of the City of London have given notice of a Bill which, however innocent in its appearance, may require to be carefully watched. It has for its avowed object the establishment of baths and wash-houses in the City—the undertaking to be a charge on the rates. But the Bill is further to empower the Commissioners to "make, construct, and maintain all such "connections, engines, machinery, and other apparatus "as may be requisite to enable them to supply the baths, "wash-houses, and buildings with water, heat, and elec-"tricity." If the Commissioners intend seeking power to break up the roadway in order to lay water-mains, and the supply is to be given to "buildings," an important principle is involved, even though the supply is not the occasion of any direct charge. It may be that the artesian well belonging to the Commissioners is not only to supply water to the baths and wash-houses, but also to the Guildhall, the Mansion House, and other civic structures. The mere power of breaking up the public streets is quite enough to make the Bill worthy of special notice, should provision of this kind be included, which appears to be highly probable.

To our mention of the Chelsea Company last week, it should be added that the Lambeth Company have given notice of a Bill to provide for the construction of additional reservoirs, and also the enlargement of the existing reservoir at West Molesey.

The Transactions of the North British Association of Gas Managers.—We have received a copy of the official report of the proceedings at the annual meeting of the North British Association of Gas Managers in Glasgow, in July last, under the presidency of Mr. J. M'Gilchrist, of Dumbarton. It is accompanied, as usual, by the lists of officers and members, the accounts, and the tabulated statistics relating to the gas supply of Scotland, compiled by the Committee of the Association.

Society of Arts.—The first ordinary meeting of this Society for the present session (the 141st) was held last Wednesday, at their rooms in the Adelphi. The new Chairman of the Council (Major-General Sir J. Donnelly, K.C.B.), in his opening address, referred at some length to the history of the Society, and detailed what it had done in the past in the cause of technical instruction. Referring to its future work, he suggested the formation of an influential examining and inspecting Board, in place of the various bodies now engaged in this important department of modern education; and he thought the Society should take the initiative in bringing these bodies together, so as to be one organization, or at least to act in co-operation. At the close of the address, for which a cordial vote of thanks was accorded, the medals awarded for papers read during the previous session were distributed.

Death of Mr. F. Weller.—The members of the Eastern Counties Gas Managers' Association have just lost an active and worthy colleague by the death of Mr. F. Weller, the Manager of the Gorleston and Southtown Gas-Works, which took place on the 17th inst., after a long illness. Mr. Weller had been Manager of the works for seventeen years; and he carried out the duties of the position in an efficient and thoroughly satisfactory manner. The Directors lose a much valued and trusted servant. Mr. Weller was a cheerful and kind-hearted man, and was ever ready to give his advice and generous sympathy to all around him. He was Chairman of the Gorleston Band Committee, took a great interest in all local matters, and won for himself a large circle of friends. He was buried last Thursday in Gorleston Cemetery; the Eastern Counties Association—of which he was Auditor from the commencement till last year, when he resigned on account of ill-health—being represented by the President (Mr. W. J. Carpenter), the Vice-President (Mr. C. W. Grimwood), the Auditor (Mr. C. Ellis), and Mr. A. Drage. A splendid wreath was placed on his coffin by the officers and members of the Association, as a token of respect for their late friend. The Secretary of the Gorleston Gas Company (Mr. W. Palgrave Brown, J.P.), and other gentlemen, attended to represent the Company. Mr. Weller leaves a widow, but no family.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1035.)

THE general run of things on the Stock Exchange during the past week has not been remarkable for any salient feature and business altogether was far from being brisk. The tendency at first was rather dull; there being more disposition to sell than to buy. But the tone mended considerably before the close; and a better feeling prevailed in most deparments, though some still found it difficult to cheer up. The gilt-edged class continues to move steadily up; and there really seems to be no forecasting what prices are coming to. The closing mark for Consols on Saturday was 103⅜—thus distancing by far the limit that was thought to have been reached a couple of months ago, when the Governor of the Bank of England made his speech at their general meeting. Colonial and Corporation loans and the debenture stocks of high-class commercial undertakings are going the same way. The Money Market is better; there is less pressure of gold; and better rates are obtainable. Business in the Gas Market was fairly up to the mark, though activity slackened somewhat for a day or two. It goes almost without saying that stocks in general are very firm; but quotations have not moved much, except for the debenture stocks, which were in brisk demand. Gaslight "A" continued the rate of activity it has displayed for some weeks past, and, for the second week running, has again changed hands every day at the old figure of 250¼. The 10 per cent. preferences and the debenture issues were in daily request at enhanced prices; and all the latter have risen in quotation. Quiet steady business was done in South Metropolitans; the "A" as well as the debenture scoring slight further advances. Nothing was done in Commercials but one bargain in the new stock at top price. Suburbans and Provinclals were extremely quiet, but commanded high figures when dealt in. Business was much restricted also in Continentals and in the rest of the foreign category; and the only change was a rise in Melbourne bonds. Business among the Water Companies was much brisker; and many advanced freely in value—the measures of the London County Council towards their acquisition creating no apprehension.

The daily operations were: The Gas Market was pretty active on the opening day; and prices began to rise at once. South Metropolitan "A" advanced 2; and Gaslight 6 per cent. debentures, 2½. In Water, West Middlesex rose 1½; and East London debenture, 2. Business was somewhat quieter on Tuesday. South Metropolitan debenture gained 1. On Wednesday, Gaslight "A" nearly monopolized attention; and the 4 per cent. debenture rose 1. Thursday also was a quiet day; but prices were still on the rise. Gaslight 4½ per cent. debenture advanced 3; and Melbourne bonds, 1. Business remained about the same on Friday. Chelsea Water went up 2; and Southwark "D," 3. Saturday's business was well up to the average, without alteration in gas issues. In Water, Kent and Southwark ordinary improved 2 each.

ELECTRIC LIGHTING MEMORANDA.

The Dinner of the Institution of Electrical Engineers—The Fate of the General Electric Power and Traction Company—Inquiry into the Cannon Street Accident—The Ventilation of Street Subways.

THE sixth annual dinner of the Institution of Electrical Engineers was held last Wednesday—Mr. Alexander Siemens in the chair. There was plenty of good company present; and without doubt the convivial electricians enjoyed themselves passably well, being English for the most part, and consequently able to assist in the proper performance of one of the most characteristic of our national "functions," with which no consideration of bad trade, ruinous competition, or what not, is ever permitted to interfere. Yet there is much in the actual condition of the electrical industries to check any tendency to exuberantly high spirits which professional electricians might be tempted to display after dining well and wisely in sympathetic companionship. The practice of electric lighting has now been in the commercial stage of development for a number of years; and it looks as if the small cares of what has become a routine business had choked the inventive effort that at the start created the existing types of electrical generating and distributing plant. Dr. Armstrong told the electricians that they move in too narrow a sphere—being "too much the slaves of the dynamo;" and he recommended them to widen their studies. It is all very well for an unattached man of science to talk like this to men who, though scientific too, are also engaged in work which must be regulated with due regard to commercial considerations. Central station electrical engineers have to make dividends, if they can, as well as to generate and supply electricity; and they have consequently learnt that it is not business to be perpetually tearing up their works by the roots in the cause of scientific progress. In other words, the most successful among them have cultivated some of that stolidity for which gas managers in general have been blamed; and, as things go, they may look for a good deal of the same kind of abuse to which the followers of the gas industry are by this time accustomed.

A melancholy story of lost capital, unremunerative working, and disappointed expectations was unfolded at the extraordinary general meeting of the General Electric Power and Traction Company, held last Wednesday for the purpose of considering a resolution for winding up the Company voluntarily. Such manufacturing business as the Company had has been transferred to two new Companies, and in this is included the electric launch business on the Thames, with which the name of Mr. Immisch is associated. With reference to the other assets, the Directors do not see their way to make any immediate recommendation which would be advantageous to the shareholders; but it remains to be seen what the voluntary liquidation will realize. Very naturally, the shareholders present at the meeting said some unpleasant things about the past management of the Company; but Mr. Immisch stated plainly, by way of explanation, that the hopes of the founders of the undertaking had been based upon the idea that "electric traction was coming to the fore," in which they had all been mistaken. Of course, the concern was over-capitalized at starting; but that is so common a trouble in connection with electrical speculation as to be scarcely worth particular comment in regard to this instance. The proceedings at the meeting can hardly have been a cheering prelude to the electricians' dinner which followed the same evening, as already noticed.

In another column will be found a report of the inquiry held by Major Cardew, for the Board of Trade, into the circumstances attending the explosion in Cannon Street. It is unnecessary for us to offer many observations here upon a matter the grave importance of which is not likely to be overlooked by electricians or gas managers or the general public. Neither are we disposed to attempt to make capital out of the affair, whether as illustrating a state of things peculiar to the City of London, or generally. Parliament has sanctioned the formation of these electric cable conduits in the public streets; and the only thing to be done now is to make the best of the matter. It is to be regretted that the Manager of the City of London Electric Lighting Company should have tried to throw the responsibility for the explosion upon the Gas Company; but it is satisfactory to observe that he did not get much by his motion. Major Cardew was very firm in holding that the Gas Company need not even put in an appearance before him, inasmuch as the Electric Lighting Company came after them, and were bound by their regulations to keep their conduits clear of gas. The attempt on the part of the representatives of the Electric Lighting Company to impose upon the Inspector the presumption that coal gas must be at the bottom of all cases of street-box explosions also failed, as it deserved to do. Coming from the source it did, and addressed to Major Cardew, the attempt was a piece of sheer impudence. It is rather curious that whereas there appeared, in our editorial columns last week, an observation, on the subject of the popular view of what is meant by "unaccounted-for gas," that "appalling pictures have been drawn of the condition of the subsoil of our large towns, into which the gas-mains must be continually pouring vast quantities of explosive gas," the principal witness on the electrical side actually used not only the same idea, but expressed in some of the same words, in putting his case before Major Cardew the day before this remark was published. Mr. D. Cook said that "millions of cubic feet of gas were poured into the subsoil of the streets of the Metropolis every year;" but it was conclusively shown on the second day of the inquiry that there was none, at any rate, in the subsoil of Cannon Street. If the last number of the JOURNAL had appeared on the Saturday before, instead of the day after, the opening of the inquiry, we should have lain under the uncomfortable suspicion of having supplied the other side with an argument.

There is talk now of ventilating the electrical conduits throughout the city; but a work of this nature will need to be very carefully gone about. Although an explosive mixture of coal gas and air is not a normal constituent of the subsoil of town thoroughfares, yet it does occasionally occur there as a consequence of unavoidable accident to the gas mains and services. With porous street services, no great harm can follow from even a considerable leak from a buried gas-pipe. But with impervious pavements, the case is altered; and escaped gas may be forced into sewers, electrical conduits, or other subterranean channels. It is not safe to leave the street-lamp columns open at the top to the burner; and it is very essential that no ventilating tube from either drain or conduit into which gas may possibly enter should discharge in a position where a flame can be applied to the outlet. Electricians may be assured, however, that it is no more to the interest of the gas industry than to their own that street explosions should occur; and if they will only keep their own plant in order, and do not endeavour to make mischief between the public and the gas companies, the latter will not put them to unnecessary trouble in the exercise of their statutory rights in the streets.

LORD FARRER ON STATISTICAL SCIENCE.

If science is measurement, as a pregnant phrase has it, then the collection and arrangement of the data for measurements must be the very foundation and beginning of science. The Royal Statistical Society, of which Lord Farrer is for the time being President, occupies itself with this useful, if not superficially attractive work; and in his Inaugural Address, delivered last week on the occasion of the first meeting of the Society for the present session, Lord Farrer told the world something of the bearings of their work upon the problems which are of paramount interest to the community. Owing, perhaps, to its name, the Statistical Society does not hold a prominent place in public favour, as do some other learned and scientific associations that are not nearly so useful. There is something repellent in the idea of a society which meets solely for the purpose, as it would appear, of reading and discussing papers stuffed with dry figures; and the uninstructed mind shrinks naturally from those tables, ratios, averages, and percentages which the working members of the organization in question actually court and talk about with manifest enjoyment. The truth is, however, that statistics, like anything else, are pretty much what we make them; and while some collections of figures are unquestionably arid, others possess absorbing interest even for people whose minds cannot be described as having an arithmetrical turn. In drawing the attention of our readers to the Statistical Society, in the hope that more of them will give it their active assistance, we are able to assert confidently that few institutions of the kind make a better return to their members and supporters, even in intellectual entertainment, while none serves a more useful purpose in the community.

In support of this somewhat bold statement, we may cite an incident of last week's meeting, when the gold medal of the Society was presented to Mr. Giffen, of the Board of Trade, in recognition of his eminent services to statistical science. It is not too much to say that, in Mr. Giffen's hands, statistics relating to the economical and social condition of the English people have been made intensely interesting; and what Mr. Giffen has done with figures in his department is continually being done by others in different branches of science under the auspices of the Society. So much of the daily work of the gas engineer and manager has to do with statistics, that the members of this profession at any rate should hardly need reminding of the advantages of a Society which has for one of its main objects that of imparting instruction in the proper collecting, selection, and digesting of numerical data. The more complex the life of a community becomes, the more highly developed industries grow, the more imperative the need for accurate and intelligible collections of guiding facts and figures relating to the life and work of communities.

Lord Farrer's address was an eloquent and convincing statement of the relations subsisting between statistics and modern progress in government, and even in moral concepts. Beginning with the most obvious connection between statistics and principles, which lies in the domain of social and industrial economy, Lord Farrer spoke in strong terms against the weakness of what used to be termed the orthodox school of political economy, in the matter of its "narrow premisses, *a priori* reasonings, and absolute conclusions." In so doing, the speaker exposed what has probably been more repellent to would-be students of political economy, as it used to be taught, than anything else in or about it. There has been a tremendous amount of imposition—using the word in the sense of a putting-upon—in orthodox political economy; and the better sense of people in the world has rebelled against the claims of the *doctrinaire* professors of the so-called science to lay down the laws for their commercial and social conduct. Economists are not alone in treading "the high *priori* road," which was indeed the common thoroughfare of all professed thinkers before the rise of modern inductive science. The trick of arguing to a logical conclusion from some preconceived premiss, the adequacy and validity of which are assumed, is as old as Aristotle, or older; and it will probably remain a besetting temptation of humanity to the world's end. It is easy to smile at the schoolman of the tale who denied that there could be spots on the sun because, having searched through his Aristotle for the purpose, he had not found any justification for their existence; but we are all liable to commit the same absurdity in the name of reason. Thus, as Lord Farrer points out, the ambitious schemers who are known by the name of Collectivists are as bad as the old arm-chair economists; for the school of these dreamers, "whilst rivalling the most dogmatic of the old economists in its *a priori* methods and in its absolute conclusions, founds those conclusions on premisses less true and on reasonings less accurate than theirs."

This pernicious method is naturally followed by all inspired zealots, by all social reformers in a hurry, and by all babblers on platforms and newspaper scribblers too ignorant to be aware of the amount of their own ignorance. They revolt against the dogmas of others, not because they know them to be wrongly based, but in order that they may set up doctrines of their own in their place. The only self guidance in political economy, as in other branches of the science of humanity, is to be found in patient observance of facts; but this is the last thing that zealots would think of troubling themselves about. The gulf between men representing such totally opposite orders of ideas as those that are associated with the names of Lord Farrer and Mr. Tom Mann is of infinite depth. If the former challenges the dicta of the old economists, he does so because his observation of the facts has led him to conclusions different from those reasoned out by them; whereas the latter ignores all facts that do not square with his preconceptions. It is just because he is an economist that Lord Farrer questions the

sufficiency and validity of the old economic theories; and it is only in economics that the solution of the problem of humanity can be found. Ethical man is troubled in spirit over the co-existence side by side of wealth and poverty; and he knows that he ought to do all he can to help the poor to a larger share of the unequally-divided goods of this world. "Economics teach, or ought to teach us, whether the present arrangements are calculated to effect this object; whether any given change in them will promote it more effectually; or whether any such change may, by checking enterprise, make the aggregate production smaller than it is, and thus diminish the consumption both of rich and poor." Here we have the gist of the whole matter—the function of economics in a nutshell. It is to be noticed also that Lord Farrer is at one with Mr. A. J. Balfour in setting up the increase of production as the essence of all industrial improvement.

If economics are abandoned by those who desire to redress the grievance of the poor, they must fall back into a terrible error. Instead of striving to amend the system under which the goods of the world are distributed, they will be tempted to turn the poor against the rich. "The divine discontent of ethics with human misery may, if unchastened by accurate thought and unrestrained by fear of consequences, degenerate into despair, producing cataclysms such as the Peasant's Revolt or the French Revolution." On the other hand, "it may perhaps be possible for political economy to show that, underlying the surface of human inequality and of too frequent want, there are laws silently operating which are constantly increasing the aggregate product of human industry, and giving a larger and even larger proportion of those increased products to the humblest workers." The last sentence indicates the line in which man's ethical impulse impels him to urge his economical studies. Is there any reason for thinking that the laws referred to by Lord Farrer as silently operating, not only in augmenting production, but also in increasing the share of the poorest producers in the result and benefit, are actually existing and working in the sense described? Lord Farrer holds that there is; and he points to the fact that the false theory of wages propounded by Ricardo, and falsely asserted by Socialists to rule the established industrial system—the theory that wages must be forced down to the lowest margin of subsistence, while the surplus profit goes to the rent owner and the capitalist—the theory, in short, that under the existing system of production the rich become richer, and the poor poorer—has been exploded. This theory, which is rightly described as having done as much mischief as any false doctrine by which men have ever been perplexed and tormented, has been disproved not so much by *a priori* or even by the operation of humane considerations, as by "the actual statistics of wages, which, imperfect as they still are, show that with improvements in production and transport the demand for skilled labour increases, that the general standard of living rises, and that, both in real and nominal wages, labour, unskilled as well as skilled, gets a proportionately increased share of an increased product." If Lord Farrer had done no more in his address than this signal service to the cause of economic truth, he would have deserved the thanks of all those who are concerned in repressing the Socialist heresy; but the passages we quote are only samples taken from a composition singularly instructive and suggestive throughout.

The argument of the address is for the better recognition of statistical science as the only trustworthy basis of economics. It was carefully pointed out that what is meant by "statistical science" is nothing more than the systematic collection, arrangement, and interpretation of data. Statistics do not constitute a separate science; but the aim of scientific method in connection with statistics is to remove the occasion for the familiar reproach that "figures can be made to prove anything." Lord Farrer named several subjects as suitable for statistical investigation, among others "the question, which is becoming more and more important every day, whether industrial enterprise can be better, more cheaply, and more efficiently conducted by private enterprise or by Governments." We want to know what, if any, are the industrial enterprises which can be best undertaken by Governments, central or local, acting solely in the public interest, and paying their extra expenditure out of taxes, and what are the industrial enterprises which can be best undertaken by private adventurers in the expectation of profit. These are questions which offer an immense field for statistical investigation. "How much should we be advanced in practical statesmanship," said Lord Farrer, "if we had accurate comparisons of the cost and efficiency of gas and water supply in the various towns of this and other countries which have adopted different methods." It was well said. Ignorance is the most costly thing in the world; and in gas supply, as in other matters which should be of general interest, one half of the world does not know how the other half lives. The magnitude and difficulty of such inquiries is only equalled by their importance; but they will have to be made, as Lord Farrer says, if we are to have any foundation for our principles and theories more certain the *à priori* arguments with which Individualists and Collectivists now carry on the discussion.

In closing this appreciation of Lord Farrer's address, we desire to observe that it is just such teaching as this that plain men—convinced beforehand that the existing industrial system is somehow right, but unable to give intelligible grounds for their faith—need to enable them to meet their opponents, who argue that the system is altogether wrong. Lord Farrer has apologized for having "added a few leaves to the pile of economic speculation for which he has in truth little taste and still less capacity;" but the community of which he is still so worthy and active a servant, at an age when most men who have worked so hard as he has would be in honourable retirement, have more reason to esteem these contributions to the literature of economics as strong buttresses of the truth of the science. Indeed, political economy would not have had so many or such bitter foes and contemners as it has to-day, if all its exponents had been as wise, as scientific, and as human as Lord Farrer.

NOTES.

The Revelations of the Electrical Furnace.

M. Henri Moissan has been working assiduously, by the aid of his electrical furnace, on the fusion and volatilization of metals and earths, and has produced a number of novel phenomena which he has described from time to time in the *Comptes Rendus*. Experimenting upon carbon, M. Moissan found that, on heating a crucible filled with coarse fragments of charcoal, all the mass of carbon is quickly converted into graphite. Afterwards upon the cold tube are found thin plates, very light, translucid, and presenting a maroon colour by transmitted light. M. Berthelot, in his numerous experiments on the progressive condensation of carbon, has already indicated the existence of a light variety of carbon of a maroon colour. This substance burns readily in oxygen with carbonic acid, and is being studied by M. Moissan. Generally, the author of these experiments concludes that, at the high temperatures he has obtained in this way, those elements hitherto regarded as the most refractory are volatilized. The most stable compounds of mineral chemistry disappear in the electric furnace either by dissociation or volatilization. Nothing remains resistent to these temperatures except a series of new compounds, perfectly crystalline, of exceptional stability. These bodies are the metallic borides, silicides, and especially carbides. Dautrée has already shown that the carbon of all our present organic compounds was originally existent in the state of metallic carbides. The electric furnace seems to reproduce the conditions of this remote geological period. It is probable that such compounds exist on stars of high temperatures. It may be added that at the same period the nitrogen would be met with in the form of metallic nitrides, while probably the oxygen existed in a free state in great quantity in a complex gaseous medium containing hydrogen carbides. How these elements can be conceived as existing together under such conditions is far from clear.

Frozen Service-Pipes in Summer.

A remarkable statement recently appeared in the letter of a gas manager published in *Progressive Age*, to the effect that during the past summer the writer had been greatly troubled with stoppages of service-pipes, which turned out to be due to frost. This, as was observed, was not expected with a temperature of 90° in the shade. The writer supposed that he must have had an excess of ammonia in his gas, which somehow had a way of "becoming oxidized and producing nitrate of ammonia." He evidently formed the impression that his distributing plant was working out an ammonia refrigerating process on its own account. More perfect washing, however, proved powerless to overcome the trouble. The gas in question was made from petroleum by the "Peter English" method, whatever this may be. The communication elicited a reply from Mr. W. Bathgate, of Winnipeg, who states that in his northern latitude it is not unusual for services to freeze up in July which have never given any trouble in the winter. Mr. Bathgate's explanation of the phenomenon is that naphthalene gradually accumulates in the service in the cold weather, and, if it is enough to cause a stoppage, has to be cleared by pouring spirits into the pipe. If, however, the naphthalene only partially fills the pipe, the supply of gas may continue good enough to meet the customers' wants, and consequently does not give rise to any complaint. When the warm weather comes, this partially-choked pipe begins to thaw out from the warmest end, which is nearest the building, and the dissolved naphthalene flows back upon the unthawed portion of the pipe, which it chokes. The pipe has then to be cleared out by spirits, only to freeze again the next day; and it takes three days to get the service clear. Mr. Bathgate thinks it probable that "coal gas will be less likely to cause this trouble than gas made from oil of a high gravity." There seems to be some misunderstanding here. It is confusing to write as if naphthalene deposits and frost were identical; and it is certainly news that less trouble is to be expected with naphthalene in connection with coal gas than with oil gas.

Photography and Photometry.

Professor Dr. H. W. Vogel, in his *Handbuch der Photographie*, discusses various matters connected with lighting. Being a German, he of course gives the preference, as a standard of light, to the Hefner-Alteneck amyl-acetate lamp. Some useful measurements of the quantity of light reflected from various surfaces are given—partly original, and partly from determinations by Kirschmann. The photographic efficiency of different

sources of light is discussed; and some interesting results are brought out. For instance, the enormous chemical activity of the light of burning magnesium is well known; but the results stated quantitatively will be startling to many. Thus, according to experiments made by Eder, the light in a well-lighted studio amounts in normal candles to from 50,000 to 100,000. Direct October sunlight gives 450,000 candles; electric arc light of 8000 candles visual intensity, from 100,000 to 300,000 candles; flash light with four grammes of magnesium powder, potassium chlorate and perchlorate, 10,000,000 candles. These numbers are referred to the photographic, or actinic, not the visual intensity of the standard candle. Nothing in the work of Dr. Vogel tends to show that any closer connection between photography and photometry is likely to be established, through the so-called law of photographic reciprocity or otherwise.

The Fastness of Coal Tar Colours.

A Committee, of which Professor T. E. Thorpe was Chairman, and Professor J. J. Hummel the Secretary, appointed by the British Association for the purpose of investigating the action of light upon dyed colours, reported to Section B (Chemistry and Mineralogy) at the recent Oxford meeting. The work of the Committee practically resolved itself into an examination for permanence of the coal tar colours, which came very well out of the test. In their general observations upon their results, the Committee state that it is remarkable how few really fast yellows are derived from natural colouring matters. The only fast and at the same time bright natural yellows are those derived from weld; and since this dye-stuff is now of little general importance to the dyer, it is gradually going out of cultivation. It is fortunate, therefore, that science has been able to replace it by efficient substitutes, so far, at least, as permanency towards light is concerned. The Committee claim that their experiments have abundantly proved that the popular idea that the coal tar dye-stuffs include only such as are more or less fugitive in colour is entirely false. Indeed, it is perfectly safe to assert, they say, that "coal tar is the source from which the greatest number of colours fast to light are at present derived, and this seems specially true of the red and yellow colours." Such an emphatic testimony to the value of the coal tar dyes ought to be widely circulated.

Sulphate of Ammonia as Sugar-Cane Manure.

Valuable testimony to the efficiency of sulphate of ammonia as a manure for sugar-cane lands is contained in the official report on the agricultural work carried on during the years 1891 and 1892 in the Botanical Gardens of British Guiana. This work was mainly directed to improving the local cane-sugar industry, which is understood to be largely a question of manuring. The results of the manurial experiments during the first year only are available; and these go to show that nitrogen, in the forms of sulphate of ammonia, nitrate of soda, and dried blood, excited a favourable influence upon the yield of the sugar-cane, and was doubtless the main manurial constituent which really governed the incremental yield. Where applied in quantities capable of supplying not more than 40 lbs. of nitrogen to the acre, sulphate of ammonia and nitrate of soda were of about the same value—both being better than dried blood; but where more than 40 lbs. of nitrogen per acre was applied, sulphate of ammonia gave distinctly the better results. About 2¼ cwt. per acre appeared to be the best quantity to use. Superphosphate of lime was an improvement when it came to be added to nitrogen and potash manurings.

The Price of Gas in Brussels.—When referring, in the JOURNAL last week, to the proposal to abolish differential prices for gas in Brussels, we stated that the new rate had not been fixed. We now learn that at a meeting of the Gas Committee of the Municipal Council held on the 17th inst., it was decided to make the price 13c. per cubic metre, or about 2s. 11d. per 1000 cubic feet. The new tariff will come into force as from January next for fresh consumers; but not until March for those who are now on the Committee's books. The existing rates, it may be remembered, are 10c. for day gas and 14c. for night gas; and, having regard to the quantities of each gas consumed, the average works out to 13·5c. Although the reduction decided upon is only to the extent of 0·5c. per cubic metre, it will, we understand, make a difference of about 68,000 frs. (£2720) in the receipts; but, of course, some of this may be made up by increased consumption.

The Semet-Solvay Coke-Oven Patents.—The Judicial Committee of the Privy Council (consisting of Lords Hobhouse, Macnaghten, and Shand, and Sir R. Couch) had before them recently a petition presented for the prolongation of the letters patent granted on Nov. 17, 1880, to Louis Victor Semet and Ernest Solvay, of Brussels, for an invention relating to "improvements in apparatus for coking and distilling coal." Witnesses were called in support of the petition, and gave evidence as to the great merit of the invention. The Committee agreed to recommend Her Majesty to prolong the patent for a period of five years; but, as the case involved some legal considerations, they decided to give their reasons on a future day. It was stated, in the course of the proceedings, that the patent taken out by the petitioners in France would expire in 1895, and that those obtained for other countries would lapse at subsequent dates—the Belgian patent expiring in 1900.

TECHNICAL RECORD

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS

Quarterly Meeting in Manchester.

The Hundredth Quarterly Meeting of the Institution was held on Saturday afternoon at the Palatine Hotel, Manchester. There was not so large an attendance as usual. Among the letters of apology for absence which were announced was one from Mr. Porter, of Elland, stating that, owing to illness, he had been unable to finish the preparation of his promised paper on "The Advantages of Mechanical Appliances in Medium-Sized Gas-Works."

The PRESIDENT (Mr. James Braddock, of Radcliffe), in opening the proceedings, said that, as the circular calling the meeting would have reminded members, this was the hundredth quarterly meeting of the Institution. Even in these days of "record" breaking, he thought this would count for something that was perhaps unequalled in the annals of Gas Associations. Singularly enough, too, the number of their members—like the number of quarterly meetings they had held—was exactly a hundred. He trusted that they might enter upon their second quarter of a century's existence with the same vigour, the same degree of usefulness, and the same identity of interest as had characterized their proceedings in the past.

The HON. SECRETARY (Mr. S. S. Mellor, of Northwich) then read the minutes of the last quarterly meeting, held at Huddersfield, and these were confirmed.

NEW MEMBERS.

The following were unanimously elected members of the Institution: Mr. Walter Lister, of East Ardsley; Mr. J. Wilkinson, of Drighlington; Mr. F. Sidwell, of Winsford; Mr. J. Baldwin, of Honley; Mr. R. West, of Hebden Bridge.

ELECTION OF PRESIDENT FOR 1895.

The PRESIDENT said that, according to the rules, they must elect at this meeting a President for the coming year, who would take office in February next. The Committee had had the matter under consideration, and had decided to recommend that the honour should be conferred on Mr. George Smedley, of Buxton. Mr. Smedley had acted in the capacity of Senior Vice-President during the current year, and Junior Vice-President the preceding year; and he had in other ways, as they all knew, contributed to the success of the Institution, of which he was an old and much esteemed member. He (Mr. Braddock) had pleasure in proposing that Mr. Smedley be elected to the office of President for the ensuing year; and he hoped that Mr. Smedley might have good health to discharge the duties, so as to receive that approval which the members of the Institution were ever ready to accord to useful and disinterested service.

Mr. W. W. HUTCHINSON (Barnsley) said that it afforded him very especial pleasure to second the election of Mr. Smedley, who was a friend of his own and also an old friend of his father. The number and quality of the members of the Institution would no doubt make Mr. Smedley feel that it was a body over which it would be an honour to preside.

The motion was unanimously adopted.

Mr. SMEDLEY, in the first place, thanked the President and Mr. Hutchinson for the very kind way in which they had put his name before the members. He could assure them, he said, that two years ago the last thing in his thoughts was that he should ever be permitted to stand at the head of the Institution. He had thought that his day was quite past. It was not without hesitation that he consented to take a post that had been filled by so many able men, as he feared that he would not be able to do the work attached to the position in such a manner as he would like. However, as he knew he had the good wishes of all the members of the Institution, he accepted the invitation; and they might depend upon it that he would endeavour to fill the post to their satisfaction.

READING OF PAPERS.

The reading of papers was then commenced by Mr. ALFRED T. FLETCHER, of Leigh; his subject being "Inclined Retorts at the Leigh Gas-Works." The paper appears on the next page; but the report of the discussion to which it gave rise is held over till next week. After the close of the discussion,

The PRESIDENT said that, in the absence of Mr. Porter—whose illness they all very much regretted—there were only two papers on their programme. The second was by Mr. W. R. Chester, from whom Mr. West had brought the information that he was compelled to absent himself owing to the serious illness of Mrs. Chester. However, next to coming himself, Mr. Chester had done the best thing, as he had sent a copy of his paper. The Secretary would read it to them.

Mr. Chester's paper—entitled "Greenhouse Heating by Coal Gas"—appears on page 1021.

Discussion on the paper having been invited,

Mr. JOHN WEST said the subject was an important one; and Mr. Chester was conducting his experiments in a very scientific manner. There could be no doubt that many people would put up small greenhouses if it were not for the trouble of heating them in the old-fashioned way with coke and coal. He thought,

however, that in Mr. Chester's absence it would be well to adjourn the discussion.

On the motion of Mr. Isaac Carr (Widnes), seconded by Mr. Smedley, the discussion was accordingly adjourned.

Votes of thanks having been passed to Mr. Fletcher and to Mr. Chester for their papers,

On the motion of Mr. J. Chadwick (Oldham), seconded by Mr. R. Hunter (Chester), thanks were accorded to Mr. Braddock for presiding.

Mr. Braddock having briefly replied, the meeting closed.

The members and a few friends afterwards took tea together.

INCLINED RETORTS AT THE LEIGH GAS-WORKS.

By Alfred T. Fletcher, Assoc.M.Inst.C.E., of Leigh.

[A Paper read at the Meeting of the Manchester District Institution, on Saturday, Nov. 24.]

During the last four or five years, few matters have occupied the attention of gas engineers to a greater extent than those connected with the retort-house, and especially with the best means of reducing the cost of carbonization, the labour cost of which is the largest item in the manufacture of coal gas. As a result of this attention, it cannot be wondered at that considerable advancement has been made, not only in the reduction of the cost for labour, but also in the production of larger quantities of gas from the same amount and class of coal, without any loss of illuminating power, and to the greater comfort of everyone connected with a gas-works. These improvements have not been effected without considerable thought and expenditure; and this applies to all the systems of mechanical stoking adopted in gas-works.

The demand for gas having rapidly increased in Leigh during the five years 1887-92, from 47 to 75 millions, repeated extensions had to be made to meet this large increase; and it became necessary for me to consider the means of best obtaining additional carbonizing plant, and especially to utilize to the fullest extent the existing floor-space of the retort-house. The paper which I have now the pleasure of submitting to you includes the whole of the extensions carried out by me on the inclined retort system, together with my experience in working the same.

Our retort-house, which is 150 feet long by 54 feet wide, in the beginning of 1892 contained two benches of retorts one on each side of the chimney-stack, which occupies the centre of the house. One bench consisted of seven double settings of fives or a total of 70 mouthpieces, each retort being 18 in. by 15 in. by 8 ft. 6 in. long, and heated by fourteen furnaces on the direct-firing system. These retorts were capable of carbonizing, by six-hour charges, 28 tons in 24 hours. The other bench consisted of three double settings of fives, each 21 in. by 15 in. by 9 ft. 6 in. long, and four double settings of sevens, each 18 in. by 15 in. by 9 ft. 6 in. long; or in all a total of 85 mouthpieces. These were heated by seven generator furnaces of my own design, placed on one side of the settings only. This bench was capable of carbonizing 45 tons in 24 hours. The first-named bench required the whole of the retorts renewing; but as we were then working at nearly our full power, I decided that it would be better to demolish it, and erect in its stead either generator settings of larger capabilities or adopt some more modern method of carbonization.

I had previously given considerable attention to the early installations of inclined retorts; and I was fully satisfied that—with a few alterations, to adapt them to the requirements of our works—we were likely to get good results. The plan I decided upon was to erect on the site of the old settings in one-half of the house a bench of seven settings; provision being made to allow sufficient floor-space for the duplication of the same immediately opposite them. This was carried out in the summer and autumn of 1892.

The retorts are ⌂ shaped, 21 in. by 15 in. by 12 ft. long, and are set at the respective angles of 31°, 31½°, and 32°. They are fitted with self-sealing mouthpieces at both ends; the lower ones being 8 inches deep only, and the upper ones 17 inches, to allow for the sockets for the ascension-pipes, which are tapered, 7 in. to 6 in. diameter; the bridge-pipes also being 6 in.

The heating arrangements for this bench are on the generator principle; the furnaces being similar in design to those erected for the horizontals in the other section of the house, and which, together with the settings and retorts (though six years old), have never yet required renewal. The setting is simple and gives every satisfaction; and it overcomes the irregularity in the distribution of the heat I had observed during my inspections of the early installations at other works. There is no doubt that the successful working of inclined retorts depends upon this important point; it being necessary that the lower end should have the same degree of temperature as the upper one. The generators are fed on the drawing side by means of a moveable charger, which allows the coke to be drawn directly from the retort into the furnace, without any extra labour in second handling, and also effects a saving in the consumption of fuel. The amount of coke used in these furnaces, averaged over the year's working, is 14 lbs. per 100 lbs. of coal carbonized. It varies according to the quality of the coal used, of which there are five different kinds. Underneath the drawing-stage is the subway for affording access to the ashpits and various regulators in connection with the furnace air-supplies. The ash-pits are constructed of blue-bricks, set in cement mortar, and steam and water are used under the fire-bars. Clinkering is almost unnecessary, and only takes place every three or four weeks. An inclined passage leads from the subway to the yard-level, for the conveyance of ashes, &c. The bench, which measures, over all, 70 feet long by 10 ft. 4 in. wide on the horizontal, is bound together by rolled steel buckstays, cross-stays, tie-rods, &c., which provide support for the drawing and charging stages, hydraulic and foul mains, measuring chambers, coal storeage hoppers, and elevator gearing.

In the first design, with a view to saving the expense of raising the retort-house roof—the height of the walls being 21 feet from the ground floor—it was decided to dispense with coal storeage tanks, and fix measuring chambers only, which were filled directly by means of a push-plate conveyor; an opening and slide being allowed in the trough for each chamber. By this means, the small hoppers were fed automatically. At the end of the bench, a drop-shoot and signal were arranged to indicate the completion of the filling. The coal handling and elevating system, which will be further explained, was equal to the requirements.

These retorts having, during the winter months of 1892, given satisfaction, it was decided to go on with the duplication of the system as previously provided for. This extension was carried out in the following manner: The bench of inclines was covered, to protect it from the weather; and the whole of the slates over that half of the retort-house were removed. The laths were taken off; and the principals were lowered to the ground intact. The side walls were then raised a height of 4 feet, and the piers continued to 10 feet, so as to form a solid rest for the longitudinal latticed girders to carry the principals. These, after being scraped and painted, were placed in position; the gable wall was carried up; and the laths and slates replaced. This allowed very efficient means of ventilation, head room, access, and light to all the plant. The cost of this portion of the extension was £332 10s.; the part of the roof raised measuring 80 feet long by 54 feet span. The necessary excavation was then made for the bench, which was erected and completed similar in design to the previous one.

After the winter's working with the measuring chambers only, I decided to erect storeage tanks for coal sufficiently large to hold 24 hours' supply, and thus do away with any necessity for running the coal handling plant during the night time. This was done not only to the new bench, but also to the older one, in which case the conveyor had to be removed from the tops of the measuring chambers, and placed on the large coal hoppers. The coal elevator was lengthened, and a shoot arranged for conducting the coal to either bench by means of a transverse conveyor. Improvements were also made in the coal-store, which lies parallel to, and adjoining, the retort-house; and a 10-horse power (nominal) steam-engine was fixed. By means of a series of clutches overhead, each portion of the conveying plant can be worked independently.

I might mention here that I have lined the whole of the slides on the elevator and conveyor troughs upon which the skids of the buckets and scrapers run, with hard wood, about ½ inch in thickness. The result of this has been to reduce the wear and tear considerably, and also (amongst other benefits) the noise of the scraping motion to a minimum—to the better comfort of the workmen.

Immediately outside the retort-house was fixed a coke-handling plant, to receive the quenched coke as it is brought from the retorts, and elevate it to a height of 28 feet, where it is deposited on a moveable screen, from which it falls into a conveyor running the whole length of a coke storeage hopper, which it automatically fills. This hopper will hold 40 tons of coke—about equal to our present maximum daily make; and it is used for the more rapid filling of carts, &c.—the yard being also kept much cleaner at less expense. When the hopper is full (which hitherto has occurred very seldom) means are provided for carrying the coke on to the coke ground adjoining.

The total cost of our entire inclined retort installation—including excavations, coal-handling plant, coal hoppers, all iron-work, floors, subway, and benches complete—was £6056, which is under £83 per ton of coal carbonized per day. It is only fair in giving the cost of this work that due allowance should be made for a retort-house which would have had to be erected to provide the same carbonizing power; and parliamentary powers would have had to be obtained for the purchase of additional land.

This works affords good opportunity for the comparison of the utilization of the area necessary for the two systems; the entire retort-house being divided into two sections, the chimney-stack being in the centre, inclined retorts carbonizing 73½ tons and horizontals 45 tons per day.

Having now explained to you the construction of the system, I will endeavour to interest you with the various points which have particularly come under my notice during the working; and I propose to commence at the elevation of the coal from the coal-store. The coal and cannel are delivered in the store by carts, which deposit their contents around and upon the coal-breaker, which is fixed beneath the floor-line of the store. The coal is broken to the proper size, and elevated a height of 36 feet to the conveyors running over the large coal-tanks. This is only done during the ordinary working hours of the

daytime, and whilst the carting is taking place; and the cost of this handling—including oil, &c., and labour attending to engine and all machinery connected with the plant—works out to 1d. per ton carbonized.

With regard to the various classes of coal employed, I may say we are using best Wigan cannel from the Abram district, and unscreened Arley coal, Arley cobbles, and Arley nuts of various sizes; and last year, during the coal strike, we used on inclines, Durham, Derbyshire, and Scotch coal.]

It is unnecessary for me to enter into any details with reference to the charging methods of this system, as they have been fully explained previously to the gas profession. I would like, however, to mention that we have perfect means of regulating the weight and delivery of the charge into the retort—the usual charge being 3¾ cwt. The comparison which I have been able to make between the charges in horizontal and inclined retorts, is that in the latter the fuel, on account of the velocity of flow down the shoot, lies closer together, and therefore in my opinion a larger charge of coal is carbonized in them. At the same time the heats require to be good and regular, so as to penetrate the charges.

There is no difficulty in removing the carbon deposited, providing it is done at regular intervals. The process which I have found to answer very well is to insert weekly a scraper of similar section to the retort; and, if this is carried out, the retorts will run through a winter's work without further attention in this respect. The result also follows that the wear and tear of the retort is lessened considerably, and we have retorts at present working after 410 days' use which are still in good condition.

The gas is taken off from the upper ends of the retorts by means of 7-inch diameter ascension-pipes. In the first installation, I used up the ascension-pipes of the old horizontal bench taken down, which were 5 inches in diameter, and was troubled in working with constant stoppages. Since increasing the size to 7 inches, this drawback has entirely disappeared; and the reason appears to me to be that the difficulty caused in the first place was owing to the fact that the gas coming from so large a charge could not get away quickly enough.

The tar produced on these settings (averaged over two years working) is 1·27 cwt. per ton of coal and cannel carbonized; the quantity from the horizontals in the same house, from similar coal, being 1·22 cwt. per ton. No trouble is found with tar in the lower mouthpieces, owing I imagine to their being so short—namely, 8 inches deep—and to the ascension-pipes being placed at the other end.

The much discussed question of illuminating power can in my opinion be explained in a few words. Having done the whole of the carbonizing we require by this system alone, I have had the opportunity of thoroughly comparing the quality and quantity of the gas produced on both horizontals and inclines; and the results of careful tests, made over limited and extended periods, and consequently with both selected and ordinary working quantities of coal, convince me that there is no appreciable difference—the majority of my observations being slightly in favour of inclines.

The retorts are drawn in such a manner as to prevent any interference in the work of the two gangs of men employed. The drawing-stage is not as wide between the two benches as I should have liked. The total width of the retort-house is only 54 feet; and this is taken up by two charging stages (one on each side of the house), each 8 ft. 8 in., two benches each 10 ft. 4 in., and one drawing stage 16 feet—this being the most efficient way of dealing with the limited area. The men are divided into two gangs, each gang of three men, eight-hour shifts; making a total of nine men on each bench per 24 hours. The work done by these men consists of drawing and charging, wheeling out coke to the yard, and attending to the fires (except clinkering, which is almost abolished here, and is done by the yard men at a cost of ¼d. per ton). They are paid 5s. each, or 45s. the lot, per day for carbonizing 36 tons 15 cwt., which equals 1s. 2¾d. per ton. The total cost of carbonizing and handling the coal and coke is 1s. 4d. per ton, as against 2s. 7½d. on our horizontals. In drawing the retorts, one gang commences on the even hours, and the other on the odd hours; and one tier of retorts on the whole of the seven beds is taken each time—an operation lasting usually 40 minutes.

Before concluding, I wish to express my opinion with reference to the starting of carbonizing plants, and say that certainly there are several points which require careful attention before smooth working can be obtained. My experience is that if anything occurs to horizontal retorts, the men having been accustomed to them so long make nothing of the difficulties; but when commencing a new system such as inclines, every little drawback is magnified. It is, therefore, a source of wonder and gratification for me to be able to say that even after so short a period has elapsed since its introduction, the work is now carried on at Leigh without the slightest trouble or hitch of any kind.

A New German Lighting Journal.—A publication devoted to the lighting industry—the *Zeitschrift für Beleuchtungswesen*—has lately been started in Berlin, under the editorship of Dr. H. Lux, who will have the assistance of an able staff of colleagues in other places. It is issued fortnightly.

THE HEATING OF GREENHOUSES AND CONSERVATORIES BY COAL GAS.

By William R. Chester, of Nottingham.

[A Paper read at the Meeting of the Manchester District Institution, Saturday, Nov. 24.]

Probably many of the members of this Institution will, at some time or other, have had their attention turned to the possibility of heating small or moderate sized greenhouses with coal gas, and some of them will probably have carried out schemes for accomplishing this purpose. The great difficulty, however, in the way of a more extended application of the system is the cost of gas as fuel, which if burned continuously at even a small rate per hour throughout the day and night soon runs up the cost to considerable figures. In spite of this drawback, however, I am inclined to think that, when all things are properly taken into consideration, it will bear a favourable comparison with any other system of heating; and if an automatic arrangement be applied to the gas supply, to increase or diminish the consumption in exact accordance with atmospheric variations of temperature, it will be found that gas is both cheaper and better adapted than any other form of fuel for greenhouse purposes—at any rate, in all those cases where a moderate temperature only of (say) 50° to 60° is required.

If we take a moderate sized conservatory of the lean-to type, 20 feet long, 12 feet wide, and 10 feet high at the top, sloping to 6 feet at the eaves, we shall have a superficial area of glass amounting to about 440 square feet. Each square foot of glass surface is capable of cooling 1¼ cubic feet per minute of heated air in the interior of the conservatory to the temperature of the atmosphere outside; so that with a glass surface of 440 feet superficial, 550 cubic feet of air will be lowered to atmospheric temperature per minute. In order to maintain a constant temperature in the conservatory it will, therefore, be necessary to provide so much heat per minute as will raise the temperature of 550 cubic feet of air the number of degrees which is the difference between the interior and exterior temperatures of the air—say, about 30° Fahr. The normal interior winter temperature required is about 50° Fahr.; the exterior temperature seldom going lower than 20° Fahr. or 12° of frost. Of course, the atmospheric temperature often gets lower than 12° of frost; but not in sheltered places, such as those in which conservatories are usually built.

Now 550 cubic feet of air represents about 45 lbs. in weight; and the specific heat of air being ·2375 as compared with water, we shall require to develop as much heat as will raise the temperature of 10·6 lbs. of water 30° Fahr. per minute, which is 318 B.T.U., or 19,080 units of heat per hour.

In a specially constructed boiler made to utilize, say, 80 per cent. of the total heat developed from the combustion of coal gas, we should be able to do this work with a consumption of 30 cubic feet of gas per hour, or 720 feet per day, which would cost, at 2s. 6d. per 1000 cubic feet (say), 1s. 9½d. This consumption is based on the rather extreme supposition that the low temperature of 12° of frost would continue throughout the 24 hours; but as this is a rare occurrence, we may take it that the comparison is as unfavourable to gas as it is possible to make it. If during the daylight the atmospheric temperature should rise, the automatic regulator would come into operation, and at once reduce the consumption of gas, and proportionately diminish the cost. It would not, therefore, be unfair to take the cost of gas at 1s. 6d. per day, as an average. On the other hand, if a conservatory of similar size were heated by coal or coke burnt in an ordinary saddle-boiler such as is customarily used for the purpose, it would require from 1½ to 2 cwt. per 24 hours, which, at (say) 8d. per cwt. delivered, would cost from 1s. to 1s. 4d. per day. Add to this the wages of an attendant to fire up and clear away the ashes (say) 2 hours per day, at 5d. per hour, the cost would be 1s. 10d. to 2s. 2d. per day. If the greenhouse be heated by hot-air flues instead of by water-pipes, the consumption of coal or coke would be still greater.

Extremes of temperature are always detrimental; and where solid fuel is used it is next to impossible to maintain that regularity in small greenhouses which is so essential. On this point alone the use of gas for heating purposes possesses an immense advantage. With solid-fuel firing, the furnace is filled up at periods of the day or night; and as it burns through there is an excess of heat developed, which raises the temperature of the house too high. Then as the fire burns down, it is allowed to fall too low; and unfortunately sometimes, at critical periods, the fire has a way of burning out from want of attention, and thus producing perfectly disastrous results. With the gaseous-fired boiler specially constructed for the purpose, this variation can never occur; and it may be depended on to maintain the temperature required with perfect regularity.

This specially constructed boiler, capable of maintaining the above high ideals, has yet to be made; for though I have experimented with many types, as at present manufactured, there are none which yet come up to the mark, and some of them fall very far short of it. The boiler must be constructed with a studded bottom, and interior tubes with gills or studs on the inside for rapidly absorbing the heat and transmitting it to the water. It must be of such length as to absorb all the heat developed by the combustion of the gas except just the amount necessary to ensure a continuous upward current; and it must

be boxed in round the burner so as to admit no more air than is just sufficient for the complete combustion of the gas. At the top it must be provided with a cover and flue pipe, for carrying away the products of combustion. The flow and return openings must be not less than the water-pipes to be heated—say, 3 inches in interior diameter; and the burner must be constructed to consume the maximum and minimum quantities of gas with perfect combustion. It must not fire-back under any conditions; and when not required it must automatically shut off all the gas except the supply to a small pilot jet, which will at once re-ignite the gas at the burner when further heat is required. The consumption of gas must be controlled by the temperature of the conservatory, and automatically increased or diminished within fixed limits, which may easily be determined. When we have such a boiler—and there are no inherent difficulties in its construction—we shall, I am confident, have a wide field for the further development of coal gas for conservatory heating; and my principal object in writing this paper is to direct the attention of makers into this particular groove. It will be a profitable one both for them and for the gas producer.

Having outlined the possibilities which are to be attained in this direction, I will now give briefly the results obtained from an arrangement I have recently fitted up at Bestwood Lodge for the Duke of St. Albans. The conservatory is 41 ft. 6 in. long, 26 ft. wide, and 24 ft. high from floor to apex of roof. The glass surface is 1965 square feet; and the cubical capacity is 19,162 cubic feet. The heating pipes are 3 inches in diameter; having a surface area of 431 square feet. The pipes were already in. The boiler is constructed of sheet copper, 15 inches in diameter and 2 feet high, with 1 inch vertical copper tubes, capped at the top, and fitted with a flue pipe for carrying off the products of combustion. The burner (atmospheric) is boxed in at the bottom, and perforations are made for the admission of the necessary quantity of air to ensure complete combustion. The burner is of the ring type, with separate taps. The boiler is placed in a second conservatory, which it heats by radiation; and the flow and return pipes have to pass outside a distance of 25 feet before they enter the large building. So that the conditions are entirely against obtaining favourable results. With a consumption of 60 cubic feet of gas per hour, the temperature of the large building was maintained at 66° with an outside temperature of 46°. The temperature of the flow and return pipes (which, by the way, are reduced to 1 inch diameter at the boiler) are as follows: Flow, 132° Fahr.; return, 87° Fahr. The effluent gases leaving the boiler were 380° Fahr.; and their analyses (average of series of tests) were as follows:—

Carbonic acid	6·0 per cent.
Oxygen	8·6 ,,
Nitrogen	85·4 ,,
	100·0

From these results the following defects are apparent: (1) The heating surface is deficient—the effluent gases being allowed to escape at too high a temperature. (2) Too large a proportion of air is permitted to enter with the gas. (3) The flow and return pipes at the boiler are much too small. (4) The radiating pipes are much too large for the boiler—*i.e.*, a much larger boiler is necessary for effective work.

I ought to mention that the whole application has been carried out as an experiment, with a view of determining the more correct proportions to adopt in the permanent installation; and to find out, on a practical working scale, how far it is possible to utilize coal gas for such a purpose with due regard to economy. On some future occasion, I may have further information on the subject, which will probably be of a wider general interest to the gas industry.

PREPAYMENT GAS-METERS.

At the Meeting of the Manchester Association of Engineers on Saturday last, a paper on the above subject was read by Mr. J. NASMITH, of Manchester. It was illustrated by diagrams and models.

The author began by pointing out that the idea of automatically providing a supply of a given commodity by the employment of a coin is not, in the strict sense, modern, as in the "Pneumatics" of Hero of Alexandria, who lived some 300 years prior to the Christian era, a device of this kind is to be found. This, probably the first "coin-in-the-slot" arrangement, possesses in it all the chief characteristics of its modern descendants. He then went on to say that, speaking generally, there are two main forms of prepayment mechanism used—namely, those in which the coin is employed as a weight to overcome the counterpoise of a lever; or those in which the coin is a gag-piece between two parts of the mechanism, previously unseparated from each other. All coin-receiving mechanism is based upon one of the principles named, although in the particular application to be considered in the paper—namely, to gas-meters—the latter is the most common.

Mr. Nasmith next referred to the large number of people who habitually burn candles or oil instead of gas; and, in this connection, he quoted the figures given to illustrate this point by Mr. John West (a Past-President of the Association), in his Inaugural Address to The Gas Institute last June, but adding a column of the percentage of consumers to the total population—thus furnishing a measure which, though possibly not absolutely, is approximately accurate. They are as follows:—

Town.	Population.	Number of Consumers. Actual.	Percentage.
Belfast	280,000	23,338	8·33
Bradford	186,000	51,760	27·83
Bristol	310,000	22,600	7·30
Carlisle	42,000	6,301	15·00
Glasgow	760,000	156,980	20·64
Ipswich	56,000	3,050	5·45
Leicester	180,000	25,041	13·91
Liverpool	614,000	76,500	12·46
Newcastle-on-Tyne	275,000	30,471	11·08
Nottingham	250,000	38,005	15·20

The number of consumers in Liverpool includes 12,000 using prepayment meters. If, therefore, these are deducted, the percentage of consumers is reduced to 10·5; thus showing how possible it is to add largely to the number of consumers.

Going back to the main subject of his paper, Mr. Nasmith stated that the principal requirements of a prepayment attachment might be briefly summed up as follows: (1) Simplicity; (2) strength; (3) accuracy; (4) prevention of fraud; and (5) compactness. He pointed out also that it is advisable to effect a complete separation of the coin receiving and delivery mechanism, so that, when no coin is in, the former can be operated without actuating the delivery mechanism, while once the coin is received it should not be recoverable until it has done its work. He then proceeded: It has been already said that prepayment mechanism is mainly divisible into two classes—the first comprising all devices in which the gravity of the falling coin is utilized to produce the effect; and the second, those in which the coin is used as a gag or connecting piece between two portions of the mechanism. In applying either of these forms of coin-operating devices to a gas-meter, two principal methods have been adopted. In one case, the action has resulted in the removal of a stop from the path of the meter drum or some other moving part, so as to allow the drum or bellows to work; the stop being again engaged when the required period of delivery was at an end. In the other form, the operation of the parts by the coin is utilized to open a valve through which the gas passes into the service-pipe, while the operation of the delivery mechanism returns the parts to their initial position, closing the valve, and so preventing the passage of gas. Of these two types of mechanism the latter is, in the writer's opinion, by far the most scientific and effective. It is the most natural way of regulating the supply of any liquid or fluid to close the orifice through which it must pass; and, although it may be said that the locking of the tangent pin, or of the rotation of the drum in a wet meter has the same effect, it is not so perfect a method of regulation. If gas is passing through a meter at a high pressure, and the meter-drum or bellows are prevented from moving by means of a stop, some gas may flow through the meter if a delivery-valve is open. In any case, just as the shutting off of all the taps of the various gas-fittings in a house prevents the passage of gas, and thus stops the meter effectually and without shock, so a similar arrangement applied to the meter itself gives the best result.

The author then passed on to describe in detail the various applications of coin-receiving mechanism to the delivery of gas, most of which have from time to time been noticed in the JOURNAL. The first declared attempt of this kind was made by a Mr. J. S. Wallace in 1887; and though the mechanism was crude, it had the merit of being designed with a clear view of the needs of the case. The next invention was that of Mr. R. W. Brownhill, which was never largely used. Thorp and Marsh followed with a device which was a great step in advance of its predecessors; and it was the first to receive any extended practical use. It was not, however, without its faults. Next came the patent of Mr. W. Cowan for certain improvements; then the attachment of Messrs. J. and J. Braddock, and that of Messrs. Sawer and Purves, in which, as in all other arrangements, the coin falls into a sealed box after having done its work; lastly, the attachments made by Messrs. W. Parkinson and Co., and by Messrs. Thomas Glover and Co. Having given particulars of the several devices mentioned, the author proceeded to say something about the various mechanical features which are designed to meet difficulties arising in practice. His remarks on this point were as follows: Remembering the list of requirements laid down at an early stage as essentials, let us see how far the various attachments described meet the case. The arrangements of Thorp and Marsh, Brownhill, and Wallace, it is not necessary to deal with, because, although some of the first-named are in use, they are practically "out of the running." It has been said that an arrangement which closes a valve rather than one which stops the meter is to be preferred; and this statement is confirmed by reason of public convenience, which would not be served if failure of the gas supply took place without warning. This is avoided by the use of a valve, which gradually diminishes the supply, and so gives ample warning before the shutting off of the gas. As was stated, it is necessary to avoid fraud, which it was at one time thought would be very serious. Experience has not justified this anticipation; but it is still necessary to guard against it. Of course, so long as the meter is working, the index is registering the quantity of gas passing, and to this extent acts as a check upon the consumer. The most obvious method of cheating the

meter would be by putting in the coin, partly operating the mechanism, and then withdrawing the coin. This is easily and simply met by the employment of a specially-shaped rotating cam, by which the coin slide is moved in Cowan's arrangement; by the construction of the ratchet-wheel in Braddock's, which will not permit of the return of the coin without reversing the movement of the cam course, and so setting the parts to their original position; and by the small roller and bracket in Sawer and Purves's, which absolutely wedges the disc, and prevents it being turned back. The coin must therefore be delivered. Another form of fraud—the introduction of wires, &c.—is now quite done away with, because in most arrangements the coin is used as a gag, and there is no part which can be operated except by it. The models which are exhibited will show how difficult it is to fraudulently use the best forms of attachment. As Mr. Frank Livesey recently said: "The methods now adopted in the best meters will prevent tampering in cases where this evidence"—the money-box—"is not forthcoming." The testimony of those who use large numbers of these attachments is proof of the fact that the best makers are now producing attachments which are substantially fraud-proof.

Dealing next with the other points laid down early in the paper, the author said: It will be seen that the mechanism used is now such that it is practically impossible for there to be any inaccuracy in the quantity of gas delivered for each coin. By means of special tools, the parts are made with as much exactness as the index; and just as the latter is relied upon, it may fairly be presumed that the new attachment can be. The whole matter turns upon the character of the mechanism, the accuracy of which depends mainly upon its positiveness and directness. The universal employment of the coin as a gag implies that, the moment pressure is employed, the mechanism begins to act; and in like manner the direct gearing of the parts to the index mechanism involves the immediate reversal of what may be called the operative portion. It may be taken as a general rule that the more positive, simple, and direct the connection is between the parts which are relied upon for doing either portion of the work, the more likely is accuracy to be attained. If this general statement is applied to any mechanism devised for this purpose, its relative merit could be easily ascertained. That this particular feature has not been lost sight of, and the necessary requirements fully met, is borne out by a remark made by Mr. Frank Livesey, who said recently: "With some meters, the losses had amounted to $1\frac{3}{4}$ per cent. on the rental; but it must be remembered that the first ones issued were not so accurate as those now made. . . . . The $1\frac{3}{4}$ per cent. includes many of these early-pattern meters; and therefore it must not be considered as a permanent feature. There is, in fact, no reason to suppose that the losses on the prepayment system should be greater than the bad debts of the ordinary consumer." This statement has received confirmation from other users; and it may therefore be taken as embodying the facts. The two other features of strength and compactness might almost be left to the judgment of those who inspect the meters. Strength is in most cases amply provided for, and, although not excessive, is, in the writer's opinion, sufficient for all practical purposes. So far as compactness is concerned, none of the attachments exhibited can be objected to on that score; but if any one is chosen for special notice in that respect, it is that made by Messrs. Braddock.

The question of changing the extent to which the effect of the operating mechanism can be varied, so as to give different volumes for the same coin, is one to which undue importance may be attached. Although changes are made in the price of gas in any locality from time to time, they are not so frequent as to necessitate elaborate mechanism for the purpose. So long as the changes can be made conveniently without disturbing the meter, all that is required is done. It may be said that it is practically immaterial whether the effect is produced by varying the action of the parts which open the valve, or those which close it. It is, of course, essential that the change be made with certainty; and, in the opinion of the writer, this can be done as effectually by means of change-wheels, as in the Sawer and Purves arrangement, as by the special device adopted by Messrs. Cowan. The matter is purely one of convenience, if looked at from the comparative point of view; and it is that which will probably decide the question, provided that the accuracy of the change is equally certain in each instance. It may, perhaps, be doubted by someone whether it is not easy for the consumer to alter the adjustment of the parts. To this it may be answered that the adjusting mechanism is enclosed in a sealed case; and that, even if any such tampering took place, it would be at once detected when the index of the meter was read, and the amount there registered compared with the coins contained in the box. In Parkinson's attachment, the limitation of the action of the coin is effected by adjusting the amount of rotation of the coin receiver—a principle which is observable in others. For instance, Cowan regulates the operative stroke of his pawl while retaining a uniform action of his pusher; and Sawer and Purves also have a fixed action of the receiver, but vary its effect by change-wheels. Braddock, on the other hand, depends on a variation of the rate of the return motion of the valve while uniformly maintaining the operation of the coin-receiver. In the opinion of the writer, it may fairly be said that gas companies have at their command attachments which fulfil all the requirements stated at an early stage, and that there is little reason to expect inaccuracy, undue cost for repairs, or liability to fraudulent use when they are employed. It is only necessary to say further that all the arrangements described have dials which show the quantity of gas paid for but unconsumed; and most of them also show the volume given for each penny.

The author next passed on to deal with another type of mechanism, known as "stop-index meters." These were, he said, briefly meters fitted with an adjustable arrangement, which enables an inspector, on receipt of a sum of money, to arrange the index so that, when gas of the required value has been passed, the meter will be stopped. In one or two cases this course is preferred; but the tide of feeling is setting in so strongly towards slot attachments, that it will probably soon be abandoned. In any case, there is nothing to prevent any slot meter from being made to use a shilling instead of a penny, as a slight change in the return gearing will effect the object. He added that it is becoming more obvious daily that the real field for the employment of prepayment attachments is that enormous one existing among the poorer classes, where the democratic penny is in more request than the middle-class shilling.

Mr. Nasmith then detailed the steps which are being taken by the various companies to induce the use of gas, and at the same time to introduce the prepayment system; accompanying his remarks by particulars in regard to the operations in this direction of The Gaslight and Coke and South Metropolitan Gas Companies. He said his system of supplying gas-fittings and a small cooker, with a "coin" meter, at a slightly increased charge for the gas, was a new departure which might have great consequences. It had taken root; and, to use an Americanism, had "come to stay." Wherever a trial had been made of it, the results had been satisfactory for both parties. The experience of those who had been bold enough to try the experiment showed that a use of from 10,000 to 20,000 cubic feet of gas per annum might be looked for from each consumer. Further, the evidence available proved that the tendency was for the consumption to grow after the system had been adopted; and where the most liberal policy was pursued, the greater use was made of gas. In a short space of time, it would be found that, by the adoption of the system, not only would light be brought to the houses of the very poorest, but would be so brought at a profit to the company or corporation supplying it. He added that it might be stated as a curious fact that it was to the private gas companies rather than to corporations that the development of the system was due; the stimulus of possible profit being apparently much stronger in the one case than in the other.

In concluding his paper, the writer expressed his thanks to the numerous firms who had enabled him to exhibit their attachments, and thus make the subject more interesting. It had not, he said, been possible to describe or illustrate every prepayment attachment on the market; but those which had been dealt with might be designated the best known—most of them being in extensive use. It was, in his opinion, well established that, considering the short time the mechanism had been required, the mechanical skill of the various makers of meters had enabled them to produce attachments of a high degree of merit and effectiveness. Bearing in mind what was required of them, the attachments were simple; and in this, as in other things, it was shown that an established need had not to wait long to be met by the exercise of the skill of the engineer and mechanician.

In the course of the discussion following the reading of the paper,

Mr. JOHN WEST said that prepayment meters were now being made in large numbers in the Manchester district, especially in the southern part of the city. The mechanical arrangements in such meters had been greatly improved since they were first brought out seven years ago. He regarded the prepayment system as applied to gas as the working man's friend; and it had caused a great increase in gas consumption among the labouring classes. The deposit system had previously been a stumbling-block in the way of a more extensive use of gas on the part of working men. With regard to the stop-meter arrangement, this would not act satisfactorily in all districts. The prepayment system enjoyed a large measure of popularity in London; the South Metropolitan Gas Company having fixed upwards of 20,000 of the meters.

Mr. T. ASHBURY expressed his surprise that the great corporations and gas companies had not encouraged more than they had done the use of gas by the prepayment system.

Mr. T. LAWSON remarked that there was probably no subject of mechanical interest on which so much ingenuity had been exercised as in the direction of meters, indicators, and work of that description.

Mr. S. BOSWELL thought the absence of change-wheels in Messrs. Glover's meter was a point in its favour. In his opinion, the pin arrangement for regulating the price, or the quantity of gas supplied for a penny, was much preferable to the change-wheel method.

Mr. D. FULTON said there was, to his mind, no doubt that the valve-closing arrangement was the most sensible method of cutting off the supply. Messrs. J. and J. Braddock's valve-closing arrangement, though perhaps the best, was open to one

objection—that the action was by means of a spring; and a spring, as they knew, should never be used if the object aimed at could be achieved in any other way. He thought a soft valve would be distinctly preferable to a hard one in any closing arrangement.

Mr. A. SAXON suggested that a prepayment system might be advantageously used for the supply of the electric light.

Mr. P. BEBBINGTON remarked that he had been trying the prepayment system on a water-meter; and it worked very satisfactorily indeed.

Mr. NASMITH, in replying to the discussion, said Messrs. Thorp and Marsh had used a soft valve; and Mr. Brownhill had a price-varying arrangement. With regard to the introduction of lead counters, washers, &c., into a meter, instead of a genuine coin, these would fall into a box which was locked and sealed by the gas company; and the inspector would readily find it out on inspection, as the lock could not be broken without being discovered by him. The present prepayment meters were practically fraud-proof. He certainly thought Messrs. Braddock's arrangement the simplest prepayment meter he had inspected.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Gasholder Construction, &c.

SIR,—Your remarks on the above are very opportune, and refer also to other branches of gas engineering. But I have for some time felt that there is no profession which gives itself away to such an extent as does that of the gas industry.

While you mourn the existence of the copyist—the hireling, as it were, and not one of the fold, who either being a surveyor whose connection is with a corporation who have taken over a gas-works, the intelligent stoker, the aspiring clerk or collector, whose prepossessing appearance and glibe tongue may have estranged the somewhat gullible committee from the proper trained but slower if more sure gas manager—it seems to me that books (such as you refer to) by traders or even handbooks used as text-books in the trade, are in these men's hands a most dangerous weapon.

A trade catalogue such as the one you refer to, which must have cost the compilers thousands of pounds, and which is distributed broadcast, and a handbook costing but a few shillings, are quite enough now-a-days to compensate for an "engineer's" training; and doubtless many moderate sized works have expended thousands of pounds on no better advice than these manuals have furnished. Added to this, many manufacturers will readily give their experience to any enquirer, in the hope of booking an order. I am far from suggesting that (say) a gasholder maker, who is daily dealing in matters which come under the purview of a provincial engineer once only in eight or ten years, should withhold the latest practice from an enquirer known to have been in the profession for a number of years. But I have instances under my notice where the fullest information has been given to men of absolutely no practical experience, and who a few years ago might as well have been grocers and bakers or candlestick makers as gas managers—or, shall we say, "engineers."

This I hold is particularly hard on those who have spent a life-long work-time in the profession, but who from the exigencies of their geographical position, may never have risen, or may never be likely to rise, higher in the profession.

Nov. 21, 1894. A PROVINCIAL NOBODY.

Unaccounted-for Gas.

SIR,—With reference to the above, there is one factor which, so far as I have seen, has received no consideration from those who have written on the subject; and yet it is of great importance in the calculations necessary to arrive at a clear understanding upon the question.

The difference between the pressure at the station meter and that at the consumer's meter is such as to materially affect the volume of gas at these points; and in making corrections for variations of temperature and barometric pressure, this also should be considered.

Assuming the station meter pressure to be 8 inches, and that at the consumers' meters to be 2 inches, it will be found (in the absence of other disturbing causes) that 1000 cubic feet at the former point will be increased to 1015 cubic feet at the latter; and, instead of a loss, a gain of 1½ per cent. is the result.

East Greenwich, Nov. 22, 1894. JOSEPH TYSOE.

Gas-Fires in Hotel Bedrooms.

SIR,—As we have devoted a great amount of time and consideration to this subject, we may be allowed to make a few remarks in connection with the points referred to in Messrs. Fletcher and Co.'s letter in this week's JOURNAL.

We are not surprised that the experienced gas engineers to whom Messrs. Fletcher and Co. submitted their apparatus for attaching to hotel fires unhesitatingly condemned it. Such attachments are quite unnecessary for hotel purposes; and in large hotels—where 500 or 600 bedrooms have to be dealt with—the cost of slot-meters (supposing such to be an indispensable part of the fitting) might prove a tolerably effective barrier to the introduction of gas-fires of any description.

In the illustrated pamphlet which we have sent out lately to every hotel in the kingdom, and which deals with this subject, we have carefully avoided recommending coin-meter attachments to hotel fires. We recommend, instead, sunk stopcocks, with removable keys, keeping the gas-fire entirely under the control of the manager of the hotel.

We would not, on any account, allow hotel guests to tamper with gas-fires; and there is not the slightest reason for their doing so. In every hotel, there is a chambermaid in charge of each floor, constantly at call. She would light the fire when ordered to do so, and extinguish it in like manner, noting in her book the length of time during which the fire was in operation; and the charge would be made in the hotel bill in the usual manner.

A notice in the bedroom would intimate the fact that a charge of 3d. or 6d. per hour would be made for the gas-fire, leaving a handsome profit to the hotel proprietor.

Glasgow, Nov. 21, 1894. R. AND A. MAIN.

The Working of Automatic Prepayment Meters.

SIR,—Noticing a report in your last issue (p. 989) of an actual trial at Hanley, I should like, with your permission, to call the attention of all gas companies adopting automatic meters to a matter which demands serious attention. In the case referred to, the County Court Judge decided in favour of the Company. Whether or not this decision would remain good if appealed against, is a matter of question. However, leaving this side of the case, there is still the matter of equity and justice. The representatives of the Company stated distinctly that the registering apparatus of the meter was correct, and registered 16s. worth of gas; while the money in the box was only 6s. 11d. His Honour remarked that a very serious issue had been raised; and he asked the Company's representative if he charged the consumer with stealing the money. The Company did not go so far as that. The inference, however, was strong. Still it was quite possible that money might have been taken out of the box, either by the consumer or by the Company's collector; or the automatic attachment might have been imperfect.

If the meter had had attached to it a coin-recording dial, the Company would at once have been able to prove that the pennies had or had not been passed into the meter; and they would have thus known where the blame lay. This dial should be worked entirely independently, both of the meter and of the prepayment attachment, so that it would act equally as a check upon one or the other; and I am very strongly of opinion that, when automatic prepayment meters come under the cognizance of an Act of Parliament, it will be compulsory tha such an appliance should be fixed to them.

Liverpool, Nov. 23, 1894. JOHN HAYNES,

A Public-Spirited Water Company.—Corporations—and companies likewise—have often been described as being "soulless" bodies. It is gratifying to find, from the *Engineering Record*, that the New Orleans Water Company do not come within that category. We learn that, owing to limited rainfall—the source which furnishes much of the water used for domestic purposes—a considerable portion of the population has been suffering from lack of water. To remedy this, Capt. L. H. Gardner, the Superintendent of the Company, announced that the Company's President (Mr. R. E. Craig) has suspended the rules forbidding water takers giving water to persons who are not takers, and the rule requiring a contract to be made for at least one year; while persons having pipes laid to their premises which have been shut off have had the water turned on again on application to the Company. Moreover, a large number of fire hydrants in the poorer quarters of the city have been allowed to run daily. This is an example of public spirit on the part of a water company which should not go unnoticed.

Selby Gas and Water Supply.—Last Wednesday, Colonel Marsh, R.E., an Inspector of the Local Government Board, held an inquiry at the Town Hall, Selby, with reference to an application by the Selby Local Board of Health for sanction to borrow £775 for gas-works purposes, and £590 for works of water supply. The Clerk to the Board (Mr. Bantoft) stated that the loan for purposes of water supply had become necessary through the recent deepening of the artesian well, and for making provision for stop-valves in the mains at various places to prevent waste. It was stated that the water supply, owing to the Railway Company and others pumping from the same source, fell from 11,232 gallons per hour in 1889 from a depth of 350 feet, to 8200 gallons per hour in the months of June, July, August, and September, 1893, and to 7700 gallons per hour in March this year. Since deepening the well, the supply had increased to 11,664 gallons per hour from a depth of 674 feet. In regard to the gas-works loan, the Board had recently increased their storeage accommodation; and through their having adopted the prepayment system, the necessary supply of meters had to be provided for. There was no opposition to either of the applications.

Official Gas-Meter Inspection at Oldham.—At a recent meeting of the Finance and General Purposes Committee of the Oldham Corporation, the Mayor (Mr. Whittaker) said that questions had been asked lately as to whether or not the gas-meter inspection office paid. On this subject, the following report had been written at his request by Mr. Toulson, the head of that department: "The office was opened in the year 1861, in a part of the public baths; and it continued there until the new office was built in 1891. From the opening of the office in October, 1861, to Dec. 31, 1893, the total number of gas-meters tested at this office was 489,741; the amount of fees for the same being £16,490 19s.—an average per year of 15,300 meters tested, and £515 in fees. Before we removed to the new office, the profits were paid over each year to the borough fund, and amounted to £3703 13s. 2d., besides paying for the purchase and maintenance of plant, and an annual rent of £25. The cost of building the new office and of removing from the old office was £2473 8s. 4d.; and the profits go to the paying of this debt. The balance now owing to the Treasurer is about £1600. . . . All sizes of gas-meters are tested at this office, from 1-light to 3000-lights. All our testing instruments are stamped and verified by the Exchequer Office in London. The business of this office has been increasing all this year, and is still increasing. The gas-meter called the 'penny-in-the-slot,' or prepayment meter, is being made in large quantities, and is taxing all our resources to meet the demands of the Oldham gas-meter trade. Last year we tested 18,276 meters, and received £634 9s. 6d. in fees; but this year we have already tested 21,054 meters, and received £666 9s. 6d. in fees."

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

Projected Important Financial Changes.

The South Metropolitan Gas Company have given notice of their intention to apply to Parliament next session for an Act to enable them to convert their capital into stock bearing a uniform lower standard rate of dividend, and to make certain changes in regard to financial and other matters. A Bill will therefore be promoted for the following (among other) purposes, or some of them :—

1.—To convert the capital of the Company, other than debenture stock, into a capital of the same or different classes, having a uniform standard rate of dividend of £5 per cent. per annum on the nominal value of such converted and consolidated capital (subject to decrease or increase with the increase or decrease of the standard price of gas), or such other standard rate of dividend as may be defined by the Bill, or prescribed by Parliament; and to allocate such capital to and among the holders of the different classes of stock and shares, and to secure to them respectively the same amount of dividend in every year as that to which they would respectively be entitled in case no such conversion had taken place, or such other dividend as may be agreed on between the said classes, or defined by the Bill, or prescribed by Parliament, and to make provision for the surrender and cancellation of the existing stock and the certificates therefor, and for the issue to, and the acceptance by, such holders of the new stock and certificates in exchange for their existing stock certificates.

2.—To empower the Company, for the purposes aforesaid, or any of them, to increase their nominal capital, and substitute an equivalent amount of stock of the same or different classes, and entitled or not to any special right or privilege as to participation in dividend if and when it exceeds the standard rate, and to allocate such capital accordingly.

3.—To enable the Company, by agreement with the holders of any stock of the Company, to alter the dividends payable thereon, so as to make the dividend on all or any classes of shares and stocks equal; and to confirm any such agreement which may have been, or which during the progress of the Bill may be, entered into.

4.—To make provision, either in the Bill or by a scheme to be submitted to and approved by the Board of Trade, with respect to the investment by persons in the employ of the Company in the capital of the Company, and for their representation in or upon the management of the Company, and for prescribing the rights, privileges, conditions, and restrictions under and subject to which such representation shall be given; and to confer on the Board of Trade and the Company all such powers as may be deemed necessary or expedient for effecting the objects aforesaid or any of them.

5.—To alter or provide for the alteration of the scale of voting of proprietors at meetings of the Company.

6.—To make provision for the offering to consumers of the gas of the Company and to persons employed by the Company of new stock of the Company at the then market price of their existing stock.

7.—To authorize the signing of warrants for dividends on the stocks, and for interest on the debenture stock of the Company, by one Director only of the Company.

8.—To confer on persons in the employ of the Company, and holding stock of, or having deposited money with, the Company, the like power to nominate persons to receive such stock or money as is possessed by depositors in the Post Office Savings Bank.

The Bill will repeal, alter, and amend all such rights and privileges as would interfere with any of its objects, and will confer other rights and privileges; and it will also repeal, alter, and amend, and, if thought fit, consolidate all such provisions as may be thought necessary or expedient in certain local and personal Acts specified.

MANCHESTER CORPORATION GAS SUPPLY.

Proposal for an Investigation into the Management of the Gas-Works.

For some time past, the subject of the management of the Manchester Corporation gas undertaking has occupied a considerable amount of public attention in the city, as the result of the action of Mr. J. W. Southern, a member of the City Council; and the questions raised by that gentleman have been freely discussed in the local press. Mr. Southern based his attack on the management on some published comparative analyses of the accounts of the Corporations of Manchester and Salford. Owing, doubtless to the manner in which the figures were presented, he was led to state that the net profit realized per ton of coal carbonized, after deducting interest and contribution to the sinking fund, was 5s. 1d. in Salford, whereas it was only 1s. 8d. in Manchester. It was, however, pointed out to him that, taking the Salford gas accounts without any qualifications, the net profit was 11½d. per ton, as stated by the Chairman of the Gas Committee of the Manchester Corporation (Alderman Gibson) and not 5s. 1d.; and that, when these accounts were brought into comparison with those of Manchester, the 11½d. was reduced to a little more than 3d. Mr. Southern accepted this correction; but he contended, in a letter to the *Manchester Guardian*, that the term "net profit" did not form any reliable basis of comparison in judging of the management of the two undertakings. In his opinion, the comparison was vitiated by the difference in the price charged for gas and in the amount required as interest on capital, as well as by the disparity in the arrangements for depreciation and sinking fund. He said the really vital points to his mind were these: (1) Cost of material; (2) production of gas; (3) value of residuals; and (4) illuminating power. With regard to the first, he showed that Manchester pays 16s. 3d. per ton for coal, as against 12s. 6d. by Salford; the production of gas being 9805 cubic feet, and the illuminating power 19 candles in the former, and 10,010 cubic feet and 18·7 candles in the latter place. As to residuals, Mr. Southern quoted 6s. 5d. per ton of material in Salford, as compared with 5s. 9d. per ton in Manchester. The outcome of all the agitation and correspondence was a notice by him of a motion which would bring the question before the City Council. It was in the following terms: "That a Special Committee of this Council be appointed to report on the present administration of the gas undertaking, with a view to determining whether it be possible to effect such improvement in working as will materially diminish the cost of production, and thereby enable the present price charged for gas to be reduced. That such Committee be empowered to visit the works, to have such statistics prepared by the department as they may deem necessary, and to call in the services of experts if desirable." This motion was considered at a special meeting of the Council last Wednesday, under the presidency of the Lord Mayor (Alderman Lloyd); and, as will be seen, it was rejected.

Mr. Southern, in his speech in support of the proposition, referred in detail to some correspondence on the subject which had passed between himself and the Chairman of the Gas Committee, in the course of which the latter expressed his willingness to meet Mr. Southern at the Gas Office, and go through the figures on which he had been acting, and which, as far as he (Alderman Gibson) could gather from a casual observation, showed about 4d. per ton in favour of Manchester. To this Mr. Southern replied that the figures in question reflected "serious disgrace" on the gas undertaking, which Alderman Gibson "might earn the gratitude of all serious and patriotic fellow-townsmen by averting." He added that he would gladly go into them with his correspondent at any time and at any place; but he thought the Gas Office was not the most convenient as it was "too much pervaded with the sentiment of *laissez faire*." Proceeding with his speech, he maintained that he had rightly given the figures as originally presented. But they had, he said, been subsequently corrected by those who were responsible for their publication; and, in accordance with his promise, he had sent the correction to the papers. He wished to point out, however, how utterly delusive these particular figures were for a comparison of working. First, there was the difference in the price charged for gas—3·105d. in favour of Manchester. Then there was the difference in the amount required to pay interest on capital—a difference of 3·557d. in favour of the city. Putting these two items together, it would be seen that Manchester started in the comparison with an advantage of 6½d. on every 1000 cubic feet of gas sold, or a total of £93,845. Before a fair comparison could be instituted, these differences must be adjusted; and this showed how futile were comparisons based on "net profits." The true test of management and working was to take the cost of the gas delivered. Manchester had some little advantage in such a comparison, because her loss from leakage was less. A considerable extent of the area of Salford was, no doubt, disturbed by slips arising from coal mining; and the loss from leakage was unusually high. But, allowing Manchester any advantage from this source, and taking the cost of gas delivered—not into the holder, but to the customer, they found, by the amended figures, that the cost of the gas delivered in Manchester was 26·648d. per 1000 cubic feet, and 22·047d. in Salford, or a difference of 4·601d. against Manchester, representing a total cost of £64,812 for Manchester gas over and above what it would have cost in Salford. This sum might undoubtedly have been in the pockets of the Manchester ratepayers had their works been as efficiently managed and their material as well bought as in Salford. But it was said: "This is an exceptional year; we have had a coal strike to contend with." In reply, he would point out that this was equally a calamity to their neighbours. If Manchester suffered, so did they; and he was entitled to point out that, if his counsel had been taken last February, and a responsible Chief Engineer had been appointed, it would have been part of his duty to see the storeage was adequate to requirements, and that at the first sign of disturbance arrangements were made to minimize its effects. The Committee chose to accept the entire responsibility, and were not now entitled to plead that others were better provided for such an emergency than they were. He had not the least feeling against Alderman Gibson or any member of the Committee; and he had no knowledge whatever of any contractor. His simple and sincere desire was to save the Manchester ratepayers some £60,000 per annum by a change of policy and management. He had arrived at the conclusion, after very serious consideration, that this money could be saved; and this being his conviction, his course was persistently and continually to impress this view of the case on the Gas Committee, the Council, and the public. He regretted to have had to make a comparison with Salford. Generally speaking, they did things so much better in Manchester than in Salford, that they took it almost for granted that in any department they must gain by comparison. But he brought in Salford because the geographical and economic conditions of the two places were the same, and because in the last ten years they could not but be struck by the improvement of Salford in this matter, and the declension of Manchester. The question was one of policy and comparison. The Gas Committee could have no valid objection to an inquiry dealing with these points. On the Special Committee proposed, he would have the Chairman and Deputy-Chairman of the Gas Committee, Sir Anthony Marshall, and Sir John Harwood, who had served on the Gas Committee, and who, if he would preside over the Special Committee, might add another to the great services he had already rendered to Manchester.

Alderman Walton Smith, in seconding the motion, said the suggestion thrown out by Mr. Southern seemed to him to be reasonable; and he thought the Council would do well to accept it. It would be a great advantage to have the results of an inquiry in which experts had taken part.

Mr. Murray said he failed to discover any ground for the motion. He dealt at length with the various points raised by Mr. Southern, and concluded by saying the gas consumers of Manchester were getting the benefit of superior gas at a lower price compared with other towns. This was, he said, moving in the right direction.

Alderman Higginbottom, the Deputy-Chairman of the Gas Committee, contended that the Committee had honestly carried out the principles laid down by Mr. Southern; and they had done what Alderman Smith had suggested. They had from time to time, during the past two or three years, secured the services of the most competent gas engineers in the country to advise the Committee. Then

they had engaged an Engineer who was supposed to be the best man they could get to come to Manchester—a man recommended by the highest expert opinion. The Committee had not been satisfied with relying absolutely on the advice of that gentleman; but, as he said, when any large extension was contemplated, they had called in the experts whom Mr. Southern recommended them to see again. They had consulted both Mr. George Livesey and Mr. Corbet Woodall. But there was another way of looking at this matter. Let them suppose they had their experts. Did the Council think that these gentlemen would agree? He ventured to say that if three experts made independent reports on any works, those reports would be in direct opposition to each other. The experts were constantly quarrelling among themselves—each particular expert having a particular "fad." This was the difficulty which any Special Committee would have to face. Mr. Southern had referred to the illuminating power of the Salford gas; but he ought not to do so without giving also the Salford test, which was less severe than that of Manchester. With regard to renewals, these had been paid for in Manchester out of revenue in a way which Salford had not done. As to the price charged for gas, the Committee wished, with Mr. Southern, to reduce it. But two years ago the Council said the time was not opportune; and both Mr. Southern and Alderman Smith voted with the majority.

Mr. HEYWOOD remarked that he had come to the meeting with the intention of supporting the motion; but after hearing the arguments *pro* and *con.*, he should vote the other way.

Alderman GIBSON spoke at considerable length in defence of the Committee. He suggested that the explanation of Mr. Southern's critical attentions was that he had a craze on the subject of gas. He declared emphatically that the Committee, with all their imperfections, managed the concern in a manner worthy of the city, and with a profit result better than any other gas undertaking in the country.

Mr. SOUTHERN, in reply, said he regretted the tone assumed by the Chairman and the members of the Committee. There was nothing insulting to them in the proposal brought before the Council, nor would its adoption have interfered with their work. All he asked was that they would call in an expert like Mr. Livesey to look at the results, and ask him if, in his judgment, these results might be improved by changes in the mode of management or construction. Manchester suffered from having no real managing head of the Gas Department. They had merely Station Managers.

Alderman GIBSON said Mr. Stevenson was more than the Manager of the Rochdale Road works. He was the Engineer who had charge of the work going on at Bradford Road; and he was the Consulting Engineer of the Committee in regard to the other works, which he visited when necessary.

Mr. SOUTHERN said he thought an expert would say that they should have, in addition to Station Managers, a person competent to advise them to take a survey of the whole work, and to grapple with the entire business. In view of the burdens of the future, he felt anxious to effect a saving by a better arrangement of their gas enterprise; and for this reason he asked for an inquiry.

On a division, the motion was lost by 19 votes to 47.

THE RECENT EXPLOSIONS IN ELECTRIC LIGHTING BOXES IN THE CITY.

Board of Trade Inquiry.

On Monday of last week, Major CARDEW, on behalf of the Board of Trade, commenced an inquiry at Winchester House, Old Broad Street, relative to the circumstances attending the explosions which occurred in the neighbourhood of Cannon Street, on the 10th inst., as briefly reported in the succeeding issue of the JOURNAL.

Mr. R. W. WALLACE appeared for the City of London Electric Lighting Company, Limited; Mr. RUSSELL GRIFFITHS for the Commissioners of Police for the City; and Mr. E. A. BAYLIS, for the City Commissioners of Sewers. The Gaslight and Coke Company were not represented.

Major CARDEW, having announced the course he proposed to pursue in conducting the inquiry, at once commenced to take evidence.

George Clark, coachman to Mr. C. Boutland, of 21, Cousin Lane, Upper Thames Street, deposed that shortly after one o'clock on the 10th inst., he was driving a brougham; and when turning from Cannon Street into Budge Row, the mare suddenly fell forward, turned on her side, and her legs went quite stiff. Directly he jumped to the ground, he felt a severe shock in both legs, and partly up the body. He could not get close enough to the horse to touch her. There was nothing unusual to be seen just then in the roadway, which was composed of wood; and there was no smoke. Before the mare died, she struggled for about four minutes, during which time she foamed at the mouth, and bled at the nostrils. He still felt the effect of the shock in his head and left side; and had not yet been able to return to work. He was in the doctor's hands. Shortly after he drove into Budge Row, there was a loud noise, and he noticed smoke issuing from a box in the pavement just outside No. 20. This was not the spot where the horse fell.

By Mr. GRIFFITHS: The state of the wood pavement was very damp; and, for this reason, he was driving at a steady rate.

James Hutchings, a warehouseman employed at No. 21, Budge Row, stated that he was standing on the loophole in front of the warehouse at the time of the occurrence. He noticed the brougham turn the corner. The horse was pitched forward on to her nose; her legs doubling up under her. He jumped down to render assistance; and as he was passing the horse, he felt a severe shock. The muscles of his legs were "screwed up;" he fell down; and when his hands touched the ground, he thought his arm was broken. He heard a rumbling noise under the ground for about 20 yards. There were two explosions—one at the corner of Walbrook, and the second in Budge Row. The explosion in Budge Row took place a few minutes after the horse fell. The rumbling noise did not continue the whole of the time. The explosion blew up the lid of the street-box situated outside the Liberator offices. It was raised about 2 feet; but the explosion was not a loud one.

Questioned by Mr. RUSSELL GRIFFITHS, witness said it was a sudden shock that he received; and it was nearly ten minutes after this that the explosion occurred. He believed he previously heard a noise as of an explosion in the direction of Walbrook.

In reply to Mr. WALLACE, witness stated that he was not quite sure whether the explosion in the Walbrook box took place first. He was certain the lid in the Budge Row box was lifted 2 feet; and he did not see anyone put it back into position.

By the INSPECTOR: Witness only felt a shock when in the immediate neighbourhood of the horse.

C. J. Willey, a postman, deposed that he was about 6 yards behind the horse and brougham when the former tumbled. In trying to pass the horse, he stepped on to the corner of the street-box on the west side of Budge Row, and felt an electrical shock, which he described as like "sparks going through every part of his body." He had one foot on the flagstones, and one on the lid. He had two distinct shocks; but they did not throw him down. As soon as both his feet were off the cover, he did not feel the current any longer. Passing into Walbrook, he saw the explosion there. Flagstones were sent into the air; and he was blown across the roadway against the wall of the Cannon public-house. He was struck by pieces of stone; and had a mouthful of concrete. He was still in the doctor's hands.

By Mr. RUSSELL GRIFFITHS: The soles of his boots were damp. After he was hurled across Walbrook, he went and looked at where the street-box had been. The pavement was disturbed; and the cover of the box was blown to pieces.

By Mr. BAYLIS: He did not remember perceiving any peculiar smell, such as would be caused by gas.

Mr. *H. M. Howell*, a clerk, said that he was at the west corner, between Walbrook and Cannon Street, when the explosion occurred. He was very dazed, and so did not remember much of the occurrence. Witness did not smell gas. He was close to the manhole at the time of the explosion; but he did not experience any electrical shock. He had previously seen the horse lying at the corner of Budge Row, and also a man groaning in the roadway.

In reply to Mr. BAYLIS, witness said he was struck by fragments of concrete. He had a cut on his knee, and a bruise on the right elbow. He was still under medical treatment.

Mr. *W. F. White* stated that he saw the horse fall as it turned the corner into Budge Row; and it slid some 3 yards on its knees. As witness stepped on to the pavement on the west side of Budge Row, he received a severe shock. He believed he had one foot on the lid of the street-box at the time; but he only felt the shock when both feet were touching the ground. He did not detect a smell of gas.

Mr. *A. Haslett*, a mining engineer, of Cannon Street, also witnessed the fall of the horse at the corner of Budge Row. He afterwards went into his office for about ten minutes; and, on returning, he saw that the horse was dead. He noticed a boy jump in consequence of a shock; and he spoke to a constable as to the danger. Just then the Budge Row explosion took place. The lid of the box rose about 14 inches, and then it dropped edgewise into the box. There were three reports, each being accompanied by a blue flash and thick smoke. There was no doubt in his mind as to its being an electric flash; it was not a gas-flame. He only heard the report at Walbrook, which occurred almost simultaneously with that in Budge Row. About 6 feet from the pavement on the west side of Budge Row, he received a shock in the calf of the left leg, which threw him to the ground; the pain extending right up the leg. He could not lift his left foot off the ground. He was taken to Guy's Hospital; and the doctors told him that the current had caught the sciatic nerve, and partially paralyzed the muscle. He was still under medical treatment.

Other witnesses deposed to having received shocks, among them being

Alfred Neal, an errand lad, who saw the horse killed, corroborated the evidence given by the coachman as to the manner in which it fell. He also received two shocks—one when about a yard from the horse; and the other when close to the street-box. These were severe shocks; and he lost consciousness. When he recovered, he looked towards Budge Row, and saw volumes of smoke coming from a hole in the pavement; and there was a noise like the pumping of an engine. This continued for about half a minute, and was followed by two reports. A blue flame issued from the hole. He also heard the report from the Walbrook explosion; but he did not see anything of it. He felt sick and had a bad headache the next day.

Benjamin Bradley, a police constable, said he was on duty in Cannon Street soon after 1 p.m. on the 10th inst. He was called to the spot where the horse was lying, apparently dead. He heard two reports soon after; and he saw the lid of the street-box opposite No. 20, Budge Row lifted about 2 feet. Dense volumes of smoke and bluish flame issued from the box about two yards into the air. The flame continued until he left to give information at the Electric Light Company's offices. He went close to the horse, and felt the shock very slightly. His boots were wet at the time. The coachman in charge of the brougham did not appear to be greatly suffering; one of the reports witness heard came from the direction of Walbrook.

By Mr. RUSSELL GRIFFITHS: Witness did not detect any smell. When he returned from the Electric Light Company's offices, two of their officials accompanied him; and he showed them where the explosions had occurred.

By Mr. WALLACE: He was absent about five or six minutes.

Police-Sergeant *Cooper* deposed that he heard the reports of the explosions. He went towards Budge Row, and observed dense smoke issuing from the street-box opposite the Liberator offices; the lid being displaced. He then went to the corner of Walbrook, and saw the lid of the box there thrown into the carriage-way—both the concrete and framework were broken in pieces. The smoke continued for about ten minutes, during which time it was gradually diminishing.

By Mr. BAYLIS: The brickwork and the pavement surrounding the Walbrook box were slightly displaced; and the kerbstone was turned over into the carriage-way.

Mr. *F. Withers*, a shopkeeper of Walbrook, stated that shortly after one o'clock on the 10th inst. he heard a subterranean noise outside his shop—a dull rumbling noise—and it was followed immediately by a loud explosion. The stone forming the covering of

the street-box was blown into the air. The pavement was displaced, and the kerbstone turned into the roadway. He saw a bluish flame coming from the box; and the smoke was of a bluish character. There was a smell like burning tar. His workpeople stated that they had noticed a smell of burning in the basement for about an hour before the explosion. The basement window was broken—it appeared to have been forced in. The sun-blind iron was also broken.

Evidence was then given by police officials as to previous explosions. The first mentioned was one on Oct. 14, 1892, opposite 17, Great Tower Street, when there were two street-boxes displaced, and a man named Loveland was injured. Some of The Gaslight and Coke Company's men were at the time searching for an escape of gas. One of the street-box lids, it was stated, was blown about 20 feet into the air. Another explosion took place on Jan. 8 last, at 10.5 a.m., in a street-box in front of 3, St. Paul's Churchyard; the cover of the box being blown into the air. On the same date, there was one at the corner of Creed Lane, Ludgate Hill, by which the cover of a street-box and a man were blown some distance away. On March 11 last, at 8 p.m., there was also an explosion in a box opposite 133, Cheapside. All these were believed to have been caused by accumulations of gas in the boxes.

Mr. *H. Freeman*, an assistant to Mr. Withers, was examined as to the smell of burning in the basement of the shop between eleven and one o'clock on the 10th inst. He himself perceived the smell on two or three occasions during the morning. It was like what would be produced by the burning of india-rubber. There was no smell of gas.

By Mr. WALLACE: Witness had never detected a similar smell in the basement previous to or since the day in question.

Mr. *D. Cook*, the Engineer and Manager of the City of London Electric Lighting Company, having put in a number of plans for the guidance of the Inspector, stated that the primary cause of the accident was the crossing of two high-pressure cables, which were being tested and put to work for the first time. One of these cables was for the supply of current to the Watling Street transformer station; the other, for the Milk Street transformer station. The Milk Street cable was inadvertently put into the Watling Street terminals at Bankside; while the Watling Street cable was laid with its inner conductor touching the lead covering of the third cable. For convenience, the Watling Street cable was made alive by current from the transformer station. When the signal was given, the man at the transformer station switched on. The inner of the conductor, as already explained, was laid against the lead covering of another cable; and therefore the inner of the whole high-pressure system was put to earth—throwing an unusual strain upon the insulation of the primary mains. The cables were all tested to a much higher pressure than anything that could be put upon them by a mistake of this kind; but, unfortunately, the rubber cable supplying the Benetfink transformer station broke down in a junction-box at the corner of Cannon Street and Budge Row. The breakdown appeared to have been due to mechanical abrasion of the outside covering. The cable had been laid nearly three years. When the mistake was discovered, the attendant at the transformer station cut the cable out; but before this was done, the leak in the junction-box had developed into a short circuit. The leak grew gradually greater; but it did not make any marked difference in the light. It, however, fired some gas which was in the conduits, and blew up the cover of the box at the corner of Walbrook, some 60 feet distant, and also moved the box cover outside No. 20, Budge Row. The short circuit outside the Liberator offices must have gone on for something like 13 minutes. Having mentioned that the Company had now 22 transformer stations in the City, witness proceeded to refer to the steps they had taken to detect gas in the conduits. Since the St. Paul's Churchyard explosion, they had had men constantly employed searching for gas. Four times since March last, letters had been written to the Gas Company, complaining of leakages of gas in Cannon Street, within 100 yards of the spot where the explosion took place; since January last, they had written to the Company 88 times, calling their attention to similar leaks all over the City. At the meeting of the Directors of his Company on the following day, he intended recommending a complete system of ventilation for the conduits, at a cost of £2000. At the same time, he wished to direct the attention of the Board of Trade, in the strongest possible manner, to the question of the responsibility of the Gas Company with respect to these explosions.

The INSPECTOR: The Gas Company have not put in an appearance; and I do not know that they had any reason to anticipate that their conduct would be called into question.

Witness said he only wanted Major Cardew to take this as a matter of complaint.

The INSPECTOR: You came after the Gas Company; and your regulations compel you to keep your conduits free from gas. We cannot go into this.

Mr. WALLACE: There must have been something to explode; and what was to explode but gas?

The INSPECTOR: We have no evidence as to gas having been noticed in this case.

Witness replied that, after the explosion, there would be no gas to detect. He acknowledged the willingness of the Gas Company to send a man immediately there was a complaint as to a leakage; but the man did not always wait until he found it. Millions of cubic feet of gas were poured into the subsoil of the streets of the Metropolis every year; so that they had great difficulty in keeping the electrical conduits free of gas.

Mr. WALLACE: The question is whether electrical contact caused the explosion of something.

The INSPECTOR: I do not think that necessarily follows in a confined space.

Mr. WALLACE: The Electric Light Company admit that there was an explosion; but there are only two ways in which the explosion could have occurred. That would be through leakages of water or escapes of gas.

The INSPECTOR: My impression is that, when such a large arc is produced as could be produced from an eccentric main, and where such large currents can pass before it fuses, the generation of heat in a confined space would be sufficient to expand the air and cause an explosion. The explosions seem to have been absolutely simultaneous.

On the resumption of the proceedings on the following day, further evidence was given.

Mr. *Cook*, referring to the remarks of the Inspector, said the Company's high-pressure mains were all concentric, and were tested to a very high degree.

The INSPECTOR, alluding to the witness's statement on the previous day, that the breakdown appeared to be due to mechanical abrasion of the outside covering of a cable, asked whether the cable was bent sharply at that point.

Witness replied that, as far as he knew, it was not bent very sharply; but men had been working a good deal in that box, drawing low-pressure and other cables, and his opinion was that they had rubbed the cable against the edge of the iron pipe. The cable which broke down was supplied under a specification which required it to stand the test of 5000 volts pressure between the inner and the outer, and 5000 volts between the outer and the earth. Immediately the accident occurred, he had all the other cables tested to a very high pressure, and found they were all sound. The accident was not an absolute short circuit, but an arc. There was no ventilation of the street-boxes where the explosion occurred; but there were a number of telephone tubes, which provided a current of air between the boxes, and they had been frequently inspected.

The INSPECTOR asked if there was any appliance for indicating that the pressure had risen to a dangerous extent upon the outer conductor.

Witness replied that there was a statical volt meter, showing the pressure between the outer and the earth, at the Company's station; but it did not automatically give any notice of the state of the pressure. It had now been found better to put in armoured cables; and he had given orders for covering all the parts of the cable not laid in iron pipes, and passing through the street-boxes, with several layers of copper strips, securely connected to both ends of the iron pipes. This must not be taken as an admission that they had been very much at fault for not doing so earlier, as this was only one of the points to be learnt by experience.

The INSPECTOR asked witness if, with his present experience, he had come to the conclusion that it was not sufficient to trust to the thickness of india-rubber insulation between a highly-charged cable and an iron street-box.

Witness said his experience tended to show that high-pressure alternating current mains should be concentric, and protected by a strong metal covering throughout their whole length. A lead-covered cable drawn through an iron pipe would answer as well.

The INSPECTOR inquired if the witness did not think a steel armouring outside the lead, if close and continuous, would be a desirable extra precaution.

Witness replied that they must not adopt too many extra precautions. He did not think it was necessary; but if the Board of Trade made such a recommendation, they would carry it out. Continuing, he said a man went round constantly to examine the street-boxes. They had no ventilating-pipes running up the sides of houses.

Replying to Mr. RUSSELL GRIFFITHS, witness said his opinion was that the Benetfink system was reasonably complete for the work being done at the time the explosion occurred. Practically, the safety of the public was in the hands of the Board of Trade, who issued regulations. His Company had followed them out to the best of their ability; and as their experience in connection with what was in some respects a new industry increased, they did more and more to prevent accidents occurring.

In answer to Mr. WALLACE, witness said everything that could be thought of was done to prevent the percolation of gas into the electric lighting conduits. It was his opinion that, if the Commissioners of Sewers permitted his Company to ventilate the explosive mixture of gas and air which found its way into their conduits by replacing some of the guard-posts at the corners of the streets with hollow posts—some arranged to take the air down, and some with an up-draught—there would be no further danger to the public from explosions. No one had any idea of the money his Company had spent to make their system safe. They supplied more high-pressure current than any other electric lighting company in the world; and they did it in a very densely populated area. As the consequence of these unique circumstances, problems which had not been solved elsewhere were constantly presenting themselves for solution. He had no doubt, however, that a far greater number of people would be maimed and killed by slipping on orange peel in the streets of London than were ever likely to be injured or killed by electricity. He had not heard of any consumer or other person not connected with the works being killed since the inauguration of the undertaking.

Mr. *G. F. L. Foulger*, Chief Distributing Engineer of The Gaslight and Coke Company, said that, in consequence of certain evidence given on the previous day, he appeared to state that there was no gas in the boxes which exploded, or in the vicinity. Immediately after the accident, the ground was examined by means of searching-rods and leak-detectors, but no trace of gas was found; and the experiments were repeated the next day, with a like result. Though he could not say this was an infallible means of detecting gas, yet under a hermetically sealed pavement, as in this case, it was bound to do so.

Replying to Mr. WALLACE, witness said he thought the ventilating scheme suggested by Mr. Cook a very bad one, as, owing to the height of the posts, a person might strike a match against them, with disastrous results. He considered a better plan would be to use their arc posts, which were about 20 feet high, for the purpose. These posts should be filled up with earth or sawdust. To prevent the gas firing-back, a 1½ or 2 inch ventilating-pipe should be carried up them, with an outlet to the atmosphere at about 10 feet high.

Major-General *Webber*, C.B., said the whole question of the ventilation of the street-boxes in the City had been gone into by him carefully, following on many years' experience both in connection with telegraph street-boxes and those of other electric light companies in London and elsewhere. The prevention of the entrance of gas into the boxes appeared to be the one measure essential to public safety, seeing that more than one House of Commons Committee had declined to allow street-boxes to be ventilated by attachments to private houses. He did not dispute for one moment that ventilation by means of inlet and

outlet pipes would be an excellent thing, if the pipes were arranged so as to secure a strong current of air to pass up and down. But he was sure the next best thing was to construct the boxes gas-tight, with glazed bricks or other suitable materials, and close all the unused pipes by wooden plugs or tarred yarn, or something of that kind. He thought it should not go before the public from this inquiry that these street-boxes, even without ventilation, were a source of danger, because they were not so except in the most unusual circumstances. This was the conclusion he had arrived at; and it was particularly the case if the boxes were constructed in an air-tight manner themselves, and if the passages between box and box were closed by plugs.

Mr. *W. G. Wagner*, analytical chemist, said that on the previous day he took samples of air contained in the Company's street-boxes at the corner of Walbrook and at the corner of Dowgate Hill. In the latter box, he found approximately 12 per cent. of coal gas, but none in the Walbrook box. As there was communication between the two boxes, he thought there would also have been coal gas in the Walbrook box; but there was not.

Mr. *J. Lister*, Outdoor Superintendent to a firm of electrical engineers, said that about eleven o'clock on the 10th inst. there was a strong smell of gas near the street-box against the old offices of the Liberator Building Society.

The inquiry was then adjourned until the following Friday.

On the proceedings being continued on Friday, the following evidence was adduced:—

Mr. *T. G. Chesterman*, M.R.C.V.S., stated that he had made a *post-mortem* examination of the mare killed by the accident. He found nothing whatever to cause death. There was no appearance of congestion; and all the internal organs were perfectly healthy. He discovered no wounds; and he could not say, as the result of his examination, what the animal died from. Its fore legs were bent up in a peculiar way; but there was no unusual stiffening of the body.

The INSPECTOR: Was there anything to indicate the passage of a current through the tissues of the body?

Witness replied that there was nothing; and there were no signs of asphyxia. There had been a slight bleeding from the nose; but that was probably owing to the fall. If he had not been told the mare died from a shock, he should have been unable to account for its death.

Mr. *H. Smith*, foreman of cable mains to the City of London Electric Lighting Company, deposed that he superintended the laying of the main from the Watling Street cable. The pipes were already in, and they had only to draw through the main, which was laid in lengths and connected together at junction boxes. The main was in about fifteen separate lengths from Watling Street to the Bankside generating station, and each length was labelled.

Replying to questions, witness said he satisfied himself that the right label was attached to each separate length of main; but men going into the junction boxes might accidentally tear them off. He noticed that the tubes were crossed at some places; but this could not always be avoided.

Mr. *Parrott*, jointing-foreman, said he superintended the jointing-up of the Watling Street main. Each length was labelled; and the men jointed them up accordingly. Since the accident occurred, he had traced the cable quite through, and had found that it was crossed with the Milk Street cable between the box in Maiden Lane and the box outside Edison and Swan's shop on the west side of Queen Street.

The INSPECTOR: When you jointed up the cables, were the labels attached so as to mislead you.

Witness: The labels were wrongly attached. This was the only instance they had had of the kind.

Mr. *A. Cook*, superintendent of cable-laying and of the transformer stations, said he gave the order for the jointing of the Watling Street cable to be performed; but he did not examine the labels before the work was proceeded with. He had been connected with electrical work for twelve years, and knew how to test a cable for continuity.

In reply to the INSPECTOR, witness said such a test would have revealed the existence of the fault. He was not present at the Watling Street station when the switching on of the new main took place, although he considered this a rather important operation. He was not aware of the exact time that the main was to be made alive. He had, however, looked into the arrangements for switching the main on; and they were the same as those on previous occasions for making a main alive.

Replying to Mr. GRIFFITHS, witness said no fixed periodical inspection was made of the insulation of the cables.

The INSPECTOR: Do not you consider that where the cables pass through junction-boxes, abrasions are likely to occur?

Witness: It might be so in the case of rubber cables.

In answer to Mr. GRIFFITHS, witness said that Mr. Peard, the Engineer of the testing department, had informed him that he had made a rough test of the Watling Street main; and he then asked him if it were good enough to be put on. Mr. Peard's reply was: "The cable is good; but the final test has not yet been taken. Can go in pillar." The meaning of the phrase, "can go in pillar," was that the main was in a fit condition to be made alive.

Mr. *Peard* was then called, and said the first he knew officially of a new main was on receiving a notification from the cable-jointing department, on a special form, that it was ready to be tested; and until he returned a signed certificate as to the result of the testing to be made by him, he was not responsible for any use made of the main. If a main were wanted in a hurry, he would be informed of the fact, and would thereupon make a rough test to discover any fault in the insulation. The cable was then put into terminals provided for it at each end. The meaning of his words "can go in pillar" was simply that the cable was ready for the final test, and not that it could be made alive. It ought not to be made alive until he returned his certificate guaranteeing that it was sound. In addition to the insulation test, a pressure test was made; and subsequently the electrostatic capacity and the copper resistance of the main were taken. This series of tests occupied uncertain periods. But he had never made them under two days; and during that time, as far as he knew, the main being tested was never used.

The INSPECTOR: You were aware the main was to be brought into work that day?

Witness: I did not think Mr. Cook would make alive a high-tension main of that importance when he knew that only a rough test had been made.

Mr. *J. M'Mahon*, foreman of the transformer department, stated that he switched on the new main at Watling Street station on the 10th inst. Mr. Cook telephoned to the effect that he was to proceed to Watling Street station, and wait for word from Bankside to switch on. He thought the main had already been charged. When he switched on, he noticed after about a minute a "kick" in the lights. His orders had always been that the pressure should be on at Bankside first, and that the switching on should take place afterwards.

Other formal evidence having been given, the inquiry terminated.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the Offices, 14, St. Mary Axe, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. J. Luff) read the notice calling the meeting; and the Directors' report and accounts, of which an epitome appeared in the JOURNAL last week (p. 983), were then submitted.

The CHAIRMAN, in moving the adoption of the report and accounts, said he thought he might congratulate the proprietors upon having had, in most ways, a fairly satisfactory year, although in one special circumstance it was not so fortunate as they could have wished. The rental showed a fair increase; and they found this more especially the case in regard to the private lighting, which they were very glad to see. The residuals, too, were better than last year; and they had paid less for coals. They had carbonized more coal, because they had done a greater amount of business. All these items were fairly satisfactory; but there was a dark side to every picture, and the Chairman of their Company had had for many years to dwell on their dark side, in the shape of exchange. There was an increase this year of £3466 in their loss on this head; and the total amount paid for exchange in last year had been £26,537, which was nearly £3000 more than they paid for their coals, purification, and wages. He feared that this misfortune would always be with them; and no matter how they strove to manage the works economically, and to do all they could to promote the prosperity of the Company, their efforts were constantly hindered by the exchange. On this matter the Government instituted a Commission, which went very carefully into the question, and endeavoured to fix the price of the rupee at 16d. They had not, however, gone anywhere near that rate in the past year; and for the £2000 sent to them last week, they only got a rate of 1s. $1\frac{13}{32}$d. He was quite sure they would be pleased to hear that during the past year they had paid off £5900 of their debenture debt. They had not been able to put by any money to meet the time when their agreement would come to an end; and nothing would more strengthen their position than to get rid of their debenture debt, which he hoped they would at no distant date succeed in doing. During the past year, Mr. David Cowie, a member of the Resident Committee, had died; and Mr. M'Caw carried on the work alone. That gentleman, however, found that it took up too much of his time; and he was therefore compelled to retire. They were considering what steps should be taken with reference to the local supervision of the accounts. The local committeeman was in a totally different position from that of a Director, because he had no share qualification—a fact which he (the Chairman) sometimes regretted. It had been a matter of surprise to the Board that more members of the wealthy community of Calcutta should not at times have become shareholders in their Company. A very small proportion of their shares were held in Calcutta; but he would be very glad if some of the local people took a greater interest in the concern. He saw recently in *The Times*, a statement made by Lord Harris, the Governor of Bombay, which he would like to quote. Lord Harris said he "could understand people in England refusing to invest capital in Indian railways while exchange remained unsteady; but he failed to understand the backwardness displayed by native capitalists in putting money in what appeared a most favourable scheme." Then there followed this statement by *The Times* Calcutta correspondent: "It is true that some few purely native joint-stock undertakings on a small scale have been started in the towns of the Presidency during the past few years; but a vast field remains practically untouched, and the development of the country would advance much more rapidly if only native capital could be attracted to the new railway and other industrial projects." This applied peculiarly to their own case. The native would get a very much better dividend than the shareholders on this side, because he would receive his dividend in rupees.

A SHAREHOLDER inquired whether religion had anything to do with the matter.

The CHAIRMAN said no; he did not think that interfered with cent. per cent., or 15 per cent. (laughter). Continuing, he reminded the shareholders that at their last meeting, he alluded to the expiration in 1901 of their agreement with the Corporation. Since that time, they had done nothing in the matter. They would, however, be most happy at any time to meet the Municipal Council, and discuss the question with them in a perfectly friendly and amicable spirit, and endeavour, if possible, to make a contract for a longer term. When they made advances before, it was thought that they were somewhat premature; but he hoped they might come to some arrangement before long. They must bear in mind that, when they made their contract with the Municipal Council, exchange was in a very different position from what it was now. He noticed that even ten years ago they lost by exchange only £9400. They had loyally fulfilled the terms of their agreement with the Municipality, and they would continue to do so; but it was to be remembered that they received only the same price now from the Corporation as before, notwithstanding the exchange, by which they were mulcted of what would otherwise be a considerable amount of their profits. He then referred, with great regret, to the loss which the Company and the Board had sustained by the death of Mr. Hammack, who was a Director and Auditor of the Company, and whose father was one of the original Directors. They had

provisionally appointed, according to their Articles of Association, Mr. Robert Miller to fill the vacancy. Four of the Directors had been, he might say, for the greater part of their lives intimately connected with gas manufacture; but they felt that they were not quite as much acquainted with Calcutta as they might be, and they believed that in this direction Mr. Miller, with his experience of Indian matters, might be of the greatest possible use to the Company. They therefore confidently recommended him to the shareholders for election. They proposed to pay the same dividend that was declared last year—8 per cent., free of income-tax. They had carried £1250 to the reserve account, which the shareholders would understand was not a fund, but an account in the works; and they carried forward £15,873, compared with £13,553 last year. This might come to help them on a future occasion. That was the last time they would meet in their old offices, as they were about to remove to Finsbury House, Blomfield Street, where they would have rather more cheerful offices, and at the same time effect a considerable saving in their rent. The Directors had most carefully gone through all the accounts. They had put down whatever they had thought was right for depreciation; and they could submit them to the shareholders with confidence. The Company was in a thoroughly sound and healthy condition; and the only thing that tended to prevent them from paying as good a dividend as they desired was the exchange, over which the Directors had no control.

Mr. N. E. B. GAREY seconded the motion.

The CHAIRMAN, in answer to questions, stated that when they received money from India, if they found they had a little spare cash, they applied it to paying off their debentures. They used to keep a little more money than they now did in Calcutta, as they received a good rate of interest for it; but they now had it remitted more frequently to England, and they made an equally good use of it here. If they lost a little in interest, they gained in security. The debentures had been paid off out of revenue; and their stocks had been written down.

The SECRETARY, in reply to a question, stated that the average rate at which their remittances were received during the year covered by the accounts was 1s. 2·355d.

The motion was then unanimously adopted; and resolutions were afterwards passed declaring the dividend recommended, and re-electing the retiring Directors (Mr. Gill and Mr. Miller) and the Auditors (Mr. A. T. Eastman and Mr. S. W. Savage).

Votes of thanks were afterwards passed to the Chairman and Directors, the Local Committee, and the officers of the Company in Calcutta and London.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Marylebone Road, N.W.—Sir W. H. WYATT in the chair.

The SECRETARY (Mr. F. H. Wybroo) read the notice calling the meeting, and afterwards the report of the Auditors, which stated that the investments of the reserve fund remained the same as last half year, and that £55,225 had been transferred, under the provisions of the Company's Act of Parliament passed during the last session, from the dividend and interest account to the credit of this fund, which formed part of the sum now deposited at interest in various banks. The repairs and renewal fund account had been closed; the amount of £7500 being carried to the credit of capital account, as provided by the above-mentioned Act. But the investment of £7534 Metropolitan consolidated 3 per cent. stock still remained as an asset of the Company. The capital of the Company now amounted to £1,432,636; and the total expenditure on works, to £1,390,090. The revenue for the half year ended Michaelmas last amounted to £125,690—an increase of £1283 on that of the corresponding period of 1893. The balance to the credit of the dividend and interest account was £64,008.

The CHAIRMAN, in moving the adoption of the Directors' report and the accounts, stated that they had succeeded in getting their Bill through Parliament, after a very long and anxious fight, in which they were opposed, he thought very unfairly, by the County Council; and there was in consequence a charge against capital account of over £3000. The way in which the County Council prolonged the fight was most unnecessary, although the matter did not turn out badly for the Company. They asked for power to raise £500,000; and the Committee gave them £440,000, and enabled them to draw £60,000 from the reserve profits. This made £500,000; and they were quite as willing to have it in this way as in the other. They also—and this was a very important matter—enabled the Company to increase their reserve fund from the low sum of £20,000, which was quite insufficient, to £75,000, which was more reasonable, and which placed their property on a firmer and better basis altogether. In the fighting connected with the Bill, all the Directors naturally took a part to the best of their ability; but first and foremost of all was Mr. Boulnois, who, from his position as a member of Parliament, was able to do more than any of them. He was sure that the Court owed the honourable gentleman great thanks for the ability and zeal he had displayed. He should also be ungrateful if he did not say how much they owed to the Secretary for the great attention he paid to the Company's business, and for the clear and full information he afforded to those who had had charge of the Bill, which had enabled the latter to speak positively on every subject. The Engineer also rendered every assistance in his power. The Directors felt that, having obtained this Bill, they would now be in a position to fulfil all the statutory obligations laid upon them. Of course, until they got the money, there was a difficulty in carrying out the large works that were wanted. In connection with these works, they owed a great deal to their Engineer, who was as capable as the Engineer of any Water Company in London, and probably in England. He was now going to plan the large reservoirs which they proposed to build at Barnes; and, if they were favoured by the weather, they might be able to begin the work of construction in January. Parliament made them pledge themselves to do this work without delay; and they had so far done it. He had to announce, with great regret, that during the past six months they had lost their excellent friend and colleague, Mr. James Meyer, who had been a Director of the Company for 29 years, and Deputy-Chairman for about a third of that time. During the whole of that period he devoted his best energy and ability to the interests of the Company; and by his kindness he had endeared himself to them all. They had appointed Mr. Boulnois to succeed their deceased friend as Deputy-Chairman and he was sure that this would be a most valuable appointment. To fill the vacancy at the Board, they would be asked to elect a Director that day; and only one gentleman had given notice of his intention to offer himself as a candidate—Mr. Hall, who had been long connected with the Company, and was formerly their Secretary. He was quite sure that, if Mr. Hall were appointed, as he hoped he would be, they would get a valuable addition to their directorate. Several gentlemen gave a hint that they would like to come forward; but when they heard that Mr. Hall was to be a candidate, they all generously withdrew, and said they would not oppose that gentleman. Under the Thames Conservancy Act which was passed this year, they had to pay a considerably larger sum annually—about £1300—to the Thames Conservators. They did not get very much advantage for this, he was afraid; but they could not help themselves. Though the increased amount was not perhaps of so much consequence to the West Middlesex Company as it was to some of the others, it was a large payment to make; and they were harassed, as the proprietors were aware, from time to time by the County Council, who had that day given notice of eight Bills for buying up the eight separate Companies. The notices had only come out that morning, so it was impossible to say much about them, as they had not had time to study them. They could, however, see enough to show that, although the County Council professed to buy them by arbitration—which was a fair way of proceeding—they endeavoured to attach so many conditions which were unfair, unjust, and he did not think he was going too far in saying iniquitous, that he was quite certain that none of the Companies could possibly willingly agree to such proposals. The arbitrators were to exclude everything that favoured the Companies, and were to include everything that could possibly tell against them. Parliament was not at all likely, however, to pass such a Bill, so that he did not feel very apprehensive; but it was a terrible thing that this public body were allowed, with the ratepayers' money, to harass the Companies every half year in a manner which was quite unfair. There had been some additions to the Company's supplies, which were now very large; and the constant system was increasing. This was a serious matter, as the consumers wasted the water so much.

The DEPUTY-CHAIRMAN (Mr. Boulnois, M.P.), in seconding the motion, desired to thank his colleagues for the mark of confidence which they had bestowed upon him by unexpectedly conferring on him the position of Deputy-Chairman of the Company. He would endeavour to follow in the steps of his predecessor, Mr. Meyer, who rendered such important services for so many years; and he could promise the Chairman his loyal support in his constant aim to protect the interests and to promote the prosperity of the undertaking. Reference had been made to the Bills which the London County Council would bring in to "transfer," as they modestly called it, the undertakings of the Companies to themselves. The Chairman had spoken of the London County Council, to which distinguished body he (the speaker) belonged. The opposition to the Company's Bill last year was the act of the aggressive section of the Council. He supposed that they would make an effort to obtain possession of the Water Companies' property as they did, by a technical flaw in the Act, to appropriate the undertakings of the Tramways Companies—practically at the price of old iron. It remained to be seen whether Parliament would sanction confiscation. He himself had the greatest confidence that the House of Commons—no matter which party was in power—would under no circumstances sanction anything which would interfere with the long-established rights of the proprietors of the Company.

A SHAREHOLDER inquired when the new stock was to be issued.

The CHAIRMAN said he thought it would not be issued at present; but he did not believe it would be any advantage to the proprietors when it was, as the latter could not receive the slightest benefit over the general public.

The motion was then put, and carried unanimously.

A resolution was next passed declaring a dividend for the half year at the rate of 10 per cent. per annum, less income-tax.

The meeting was then made special, for the election of a Director.

Mr. BICKERSTAFF proposed the appointment of Mr. George Barton Hall. He said that gentleman had served the Company for 48 years, for 13 of which he had acted as Secretary; and he had every reason to believe that Mr. Hall proved a most loyal officer.

Mr. HOWSON seconded the motion, which was unanimously adopted.

Mr. HALL, in acknowledging his election to the high office of a Director, assured them that he would do all in his power to promote the welfare of their great Company. He was much obliged to Mr. Bickerstaff and Mr. Howson; and he felt grateful to the Directors for the kind way in which they had received the proposal. He especially desired to thank the Chairman for the support and encouragement he had given him on every occasion.

The usual votes of thanks were heartily accorded; and the proceedings then terminated.

The Lead-Poisoning Question at Mossley.—At the last monthly meeting of the Mossley Town Council, the Medical Officer of Health reported that on the 1st inst. he accompanied Dr. Houston (who had been appointed by the Local Government Board to investigate the condition of the Swineshaw water) to Greenfield, afterwards going with him to Swineshaw, where all the springs were tested and found to be acid. The water from Higher Swineshaw running into Lower Swineshaw was ascertained to be as acid as the water in the gathering-ground. The Brushes reservoir was neutral, or contained such a small amount of acidity as not to have any action on the service-pipes. This acid condition of the water had the power of dissolving and corroding lead piping; and it would have to be neutralized by an alkali before the danger could be prevented and the water made absolutely safe for domestic purposes. How this was to be accomplished, it was not within his province to say.

THE WINDING UP OF THE ST. IVES GAS COMPANY.

Under the winding-up order recently made against the St. Ives Gas Company, the first meeting of creditors was held in London on Thursday last, before Mr. WARLEY, Assistant Official Receiver.

Mr. WARLEY said the statement of affairs had not yet been filed; so that he was unable to give any full particulars. So far as he had been able to ascertain, the liabilities, apart from a balance of £3000, alleged to be one upon the purchase, amounted to about £500. The chief assets were: Book debts about £40, and unpaid calls £80, estimated to produce £30. There was stated to be an amount of cash in the hands of the Manager, but that was a doubtful asset, as the Manager denied that anything was due from him; and the result would depend upon accounts being taken. The Company was formed in March, 1893. The nominal capital was £6000, of which £1485 appeared to have been actually issued, though it was stated that some further capital had since been subscribed. Under the original agreement, the Company was to purchase the works from Mr. Frederick Pope for £4500. Mr. Pope, it was understood, had an agreement to purchase them from the freeholders for £3500. Of the £4500, £1500 had been paid to Mr. Pope—£1300 in cash, and £200 in bills which were outstanding. Mr. Pope did not complete his purchase from the freeholders; and the latter had recently re-entered into possession of the whole of the property, and sold it to the St. Ives Corporation. Mr. Pope had paid the freeholders £500 on account of his purchase, leaving £3000 still due. He (the Chairman) had no certain information as to the price paid by the Corporation; but £2000 had been mentioned. There had been several executions put into the Company's property; one being at the instance of the bankers and the Taff Llantwit Colliery Company (their total claim being £145), and the expenses of the Sheriff. The execution had realized £236; but the money was still held by the Sheriff, in consequence of interpleaders having been put in by the freeholders. Should the contention of the freeholders fail, there would apparently be £90 returning to the Company. There had also been three small distraints for rent. The claim of the freeholders to resume possession of the property was based upon a clause in their agreement to sell to Mr. Pope. That would have to be tested in the usual way.

Mr. BRADLEY, the petitioning creditor, supposed the Official Receiver, if appointed liquidator, would not be able to undertake the necessary proceedings in the matter.

Mr. WARLEY replied that in the absence of any funds available for the purpose, he would not be in a position to enter upon proceedings involving costs without an indemnity from the creditors.

Mr. BRADLEY observed that he himself was a creditor for £125, and, with two others, represented the bulk of the indebtedness. They were prepared, at their own risk, to take proceedings against the freeholders, with a view to recovering possession of the property and works, together with damages for illegal seizure. Their contention was that the Company were not tenants, as they had not paid any rent; and it appeared to be an extraordinary proceeding that freeholders should be able to re-enter into possession of property which they had contracted to sell, without even giving any proper notice of their intention to do so.

Mr. WARLEY observed that the whole question would turn upon the terms of Mr. Pope's contract.

Mr. BRADLEY added that they were determined to take action in the matter, as it appeared to be the only prospect of obtaining any return for the money they had lost. With that object, it would be in the interests of all parties that Mr. C. Sandell, the late Secretary of the Company, should be nominated to act as liquidator.

After some discussion, a resolution to that effect was unanimously adopted; a Committee of Inspection being also chosen—viz., Mr. E. A. Williams, Mr. C. Clare, and Mr. P. Morrison.

At a meeting of shareholders held later the same day, considerable complaint was made as to the management of the Company. A lady shareholder stated that no accounts had ever been issued by the Company. She produced a letter she received from the Secretary (Mr. C. Sandell) in May last, in which she was assured that the Company was in a most flourishing condition. She complained that the smaller shareholders, after being induced to invest their money, had been kept entirely in the dark up to the eve of the failure. Mr. R. P. Keys stated that he was asked to act as Auditor of the Company; but from first to last he never had a figure put before him, and had not been requested to attend a single meeting. He considered that there had been great laxity on the part of the officials; and he felt bound to enter his protest against the appointment of one of these very officials as liquidator. Another shareholder produced a letter signed by the Secretary on June 9 last, in which no mention was made of the Company being in difficulties. Mr. Sandell replied that at the date in question the Company had not had a single action brought against them; and there was every reason to suppose that they were doing well. As regards the accounts, their issue had been prevented by the inability of the Directors to obtain from the Manager certain figures relative to the stock. Mr. R. Jeffrey stated that he became a shareholder in February last; and before doing so he was assured by one of the Directors that his money would be perfectly safe. He had since been unable to obtain a scrap of information as to the Company's affairs either from the Secretary or from any other official The Chairman observed that the shareholders had apparently reason to complain that they had not been acquainted with the position of their affairs; but it was not clear that their possession of such information would have averted the failure of the Company, which appeared to have been entirely caused by the action of the freeholders. Mr. Jeffrey replied that it would at least have enabled the shareholders to take some united action, with a view to preventing their property being sacrificed as it had been. The Directors must have had notice of the intended action of the landlord before the seizure. Mr. Nutt, a Director, strongly protested against this suggestion, and added that the fact of notice not having been given was one of the grounds upon which he intended to challenge the action of the landlord. A gentleman well known in the district had been prepared to give £3000 for the property; but he was persuaded not to bid against the Corporation, who desired to have it. Mr. Keys reiterated his protest against the liquidation of the Company being left in the hands of one of the officials who had brought their affairs into their present pass. He felt very strongly that a searching investigation was needed into the whole history of the Company; and for that purpose he should move that the matter should be left entirely in the hands of the Official Receiver. Mr. Nutt said the Directors would have no objection to the Official Receiver as liquidator. The position of affairs, however, was that a few of the largest creditors and shareholders were willing to undertake the expense of litigation for the purpose of recovering the property, and, if possible, damages as well. If their efforts were successful, the general body of creditors and shareholders would have a prospect of recovering some of their money; whereas if they left the matter to be wound up in the ordinary routine, they had no chance of receiving anything. After further discussion, the shareholders present, with the exception of Mr. Keys and one or two others who abstained from voting, confirmed the resolution passed at the creditors' meeting. The Chairman observed that he should report the result of the voting to the Judge, who would decide the question as to the choice of a liquidator. The accounts, when filed, would also be fully investigated, and the Official Receiver's report and observations upon them would be issued to the creditors and shareholders at the earliest possible date.

THE FIRE RISKS OF ELECTRICITY.

The following remarks on the risks of fire attending the use of electricity for lighting and other purposes in buildings are taken from an article in a recent number of the *American Exchange and Review*:—

The constantly increasing use of electricity for the illumination of factories, stores, theatres, and dwellings causes a very considerable addition to the general fire risk. Underwriters now require the placement of electric wires by strict and definite rules; yet in time, or by accident, a good installation may become disarranged (very little is enough to incite fire), and unexpected causes may make unsafe that which was declared safe and invulnerable by the best experts. Industrial establishments, of which we desire more especially to speak, may become liable to danger in this respect if using their own dynamos to excite electricity for power or illumination, or if renting an electric current of a certain strength brought into the buildings by wires from outside central stations.

It will be noticed from what follows that parties renting or paying for the use of a current of electricity are exposed to more danger than those using their own dynamos. The latter, being usually in the basement along with the boilers and steam-engines actuating them, and generally set on very firm bases, do not, in themselves, cause as much fire danger as the wires they serve. These, however safely installed, are liable to a number of casualties. If they are located where there is much tremor of floors from machinery in motion—such as looms, pickers, &c.—the insulating covering may wear off in places, and a too strong current, which is always liable to be actuated in them, may heat them to a white heat, with almost instantaneous burning of certain portions where the highest circuit exists. Water spilled on floors beneath which are fastened the wires on strips of dry wood, or on a wooden ceiling, may cause short-circuiting while the current of electricity is in action, with ignition as a result. This would cause burning of the inflammable insulating material, and its dropping in blazing particles upon light goods, such as cottons or materials like oiled wool or cleaned and open cotton, left incautiously under unprotected wires. We say "unprotected," because shallow tin pans swung under the whole length of the wires would eliminate such danger where the most inflammable materials were located, and also in other portions of the works. This plan has the additional advantage of not covering the wires from view. It is curious that a slight fire in a cotton or woollen mill, not arising from electric wires, might be made worse by the short circuiting of electric wires occasioned by water of extinguishment, through the burning thereby of the covering of wires, and the falling of such burning particles on open cotton or wool.

Incandescent electric lamps are the kind generally used for interiors of industrial establishments, as being the safest; but if for any reason arc lamps are employed, unless the open lower part of the globe is protected by a metallic pan, sparks and pieces of ignited carbon may fall on inflammable goods below, or on paper spread over the floors, causing ignition. A notable instance of what was believed to be ignition by this mode was the occurrence of a fire which destroyed a large mill on Randolph Street, in the northern part of Philadelphia, and caused the loss of several lives. Since then one of the requirements of underwriters has been the protection, without tight closing, of the lower opening of arc light globes. Proper regard for safety requires that no inflammable goods shall be allowed below either arc lamps or electric wires, whether protected or not.

The current supplying electric arc lamps is much stronger than that needed for incandescent electric lamps; and if by any accident an excess of current should be thrown into the incandescent wires, they would probably do more damage than wires for arc lamps if similarly over-excited. Where the two kinds of lamps are used in one establishment, the utmost caution should be employed so that those for arc lamps may not by any possibility touch incandescent lamp wires or telephone wires. The danger in such case is considerable with those last mentioned.

One great jeopardy of a rented, low-pressure current for incandescent lamps served by outside wires is that a much more heavily charged wire for arc lamps or for power may sway against, in the street, or fall upon, wires for incandescent lamps or telephone entering an industrial establishment—sending an abnormally high voltage into the wires within, causing perhaps incandescence of the weaker current wires and burning of their covering—especially where weak spots exist, but which places would otherwise have sustained intact the current force intended for them.

In the same manner to a greater degree, though more rarely, wires outside during a heavy electric storm (in this case static or high tension electricity) may cause disaster to a building by instantly

flashing over light or telephone wires within, and igniting the wire covering, telephone cases or materials in use, in the manner already mentioned. Should electricity from a severe storm enter an industrial establishment having its own dynamos, through the outside telephone wires, a similar condition may occur, though there is perhaps less danger of or from such accident than where both kinds of wires are located outside. It should be noticed that in such cases the injury is effected by the static electricity through the wires conducting it to weak or dangerous spots.

When from any cause burning particles of wire covering fall upon the floors of factories littered with paper or oiled wool or cotton, the establishment may be entirely destroyed through the suddenness of the attack, and its being so widespread in a number of storeys at once. Many telephone wires and their cases in factories, and large switch-boards in central stations, have been ignited by static electricity sent instantly in a vast current into the buildings by lightning through telephone wires—in some instances causing very disastrous fires.

One of the modes whereby over-excited electric lamp wires may become dangerous is when they run perpendicularly on wooden strips on walls of factories where wool, cotton, or waste is used or stored. Should the insulating covering of such wires become in any way ignited, the stock which might be carelessly piled against or near them or their wooden casing could easily become ignited. Wooden casing to prevent injury to wires and short-circuiting has some advantage; but it should not be forgotten that such dry wood under certain circumstances can itself become ignited from the overhead wires. Covering with wood or by running wires through pipes has the great disadvantage that injury may arise in the wires, and there may be great difficulty in locating it.

The thick copper wires which convey a strong electric current from central stations to the dynamos under trolley electric cars, which have now become so numerous in American cities and towns, may, by crossing and touching electric light or telephone wires, send excessive electrification into industrial establishments and other buildings, with results as already indicated. In such case, the effects might be worse than that from an arc-light wire, because the electric current is far stronger in such overhead trolley wires; it being also maintained thus in nearly equable degree by supplemental charges from subterranean wires at intervals of several blocks, or less, to restore the energy to the main wire as it is expended by use on the car.

It will be useful to compare the jeopardy of gas and electric illumination. It should be observed that with the latter, especially for cotton, woollen, and shoddy mills, the dangerous necessity is avoided of carrying, often twice a day, an open or closed light to start illumination by gas. Many factories have been burned from this cause. It is true that all the gas-lights of a room may be lighted at once by electric wires served by jar cells; but such arrangement is far from being prevalent in factories lighted by gas. There is also the liability of combustible material or very light fabrics being blown by a draught into a gas-flame. Such a condition with an arc light is not probable, on account of the large surrounding globe; and it is almost impossible with an incandescent electric lamp. Some most serious fires have been occasioned by gas-flames touching light fabrics or cotton slivers; but it is difficult to ignite a very light fabric by an incandescent lamp in action, unless the stuff is wrapped round the bulb for some time.

The slipping of belts actuating dynamos in industrial establishments or at central stations may occasion damage to some wires by the dynamos being started again at excessive speed—forcing momentarily too great a current through the wires; and that moment may be time enough to produce mischief. Electricity is the most active of all workers. To avoid inconvenience, if not from fear of danger, high-speed (1000 to 1200 revolutions per minute) steam-engines are now frequently used to drive the armature of the dynamo fastened on the main shaft of the engine. This plan may have its advantages; but we think they are counterbalanced by the high speed being liable to cause heating of the main shaft and boxes, which may become a source of expense and loss, if not of fire danger. In general, it may be said that electric lighting by both systems and power from electric stations are all admirable; while probably more than three-fourths of the fire risk they occasion is preventable, and would not occur if employees would use the care and attention properly due to engines for this purpose and to electric wires.

Having spoken of the liability of excessive electric current to invade wires of buildings, it should also be stated that in no instance should an installation of electric wires be made without there being placed on, or very near, the wall where the wires enter from without, a metallic cut-off of soft metal several inches long, which would bear the normal current needed, but would fuse and break the connection should excess of current invade the wires. There ought also to be care observed about the use of converters of alternating to continuous currents, or *vice versâ*, which may serve a large number of lights in certain departments; for we have noticed such apparatus which constantly produced a loud humming and so much heat that one could not bear the hand upon the outer metallic casing. This production of heat is not remarkable when an alternating current of electricity, moving at the rate of 50 to 200 vibrations per second, is suddenly changed to a continuous current.

From the foregoing remarks, it is evident that electric currents from central stations to industrial establishments for illumination and power, besides the use of dynamos in factories, are at present liable to certain kinds of jeopardy; but these will not necessarily increase with the greater use of electricity in all its forms. It is therefore very needful to keep properly in view the fire risks pertaining thereto; since, with new arrangements, such jeopardy must vary considerably, and, as already intimated, may diminish instead of increase in ratio.

Purchase of the Clonmel Gas-Works by the Corporation.—At a recent special meeting of the Clonmel Corporation, it was unanimously resolved to approve of a deed by which the Council agree to purchase the Clonmel Gas-Works as a going concern for £13,000. The present Company will, it is understood, continue to manage the works for the benefit of the ratepayers pending the passing of a Bill through Parliament to give the Corporation the necessary powers.

THE LONDON COUNTY COUNCIL AND THE WATER COMPANIES' UNDERTAKINGS.

Parliamentary Notices for Transfer Bills.

Last Tuesday, notification was published of the intention of the London County Council to apply to Parliament in the ensuing session for authority to acquire by agreement or arbitration, the undertakings of the eight Metropolitan Companies—viz., the Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex. The notices have been prepared mainly on the same lines; and they embrace the following points The transfer of the undertakings by agreementor on arbitration terms; the appointment and procedure of Arbitrators; the settlement of the terms of transfer; special directions to the Arbitrators; obligation to lay mains and provide water; the amendment of the Companies' Acts; back dividends; the transfer of parts of the undertakings to County Councils or Local Authorities; the conversion, redemption, or extinction of debenture stock, &c.; the creation of stock; costs and expenses and charges upon the county rate. It has been necessary to give eight separate notices; but the following abstract of the one referring to the Chelsea Company will, *mutatis mutandis*, serve for the others.

The opening paragraph sets forth that the Council wish to be empowered to enter into and carry into effect any agreement for the sale and transfer to them of the Company's undertaking, or any parts thereof, for such consideration and on such terms and conditions, as may be agreed upon. The undertaking is to be defined, for the purposes of the Bill, as including the water-works and works connected therewith, and all property "real and personal, money, securities, and effects, and all rights, powers, authorities, and privileges of the Company, of whatever nature and description, or some part or parts thereof." Provision will be made that, in the event of no such agreement being arrived at within such date as may be fixed by the Bill, the undertaking is to be transferred to and vested in the Council on terms to be arrived at by arbitration, in manner and subject to the conditions expressed in the Bill. Arbitrators are to be appointed by the Council, the Company, and the Board of Trade respectively, or in such other way as may be defined in the Bill, to settle and determine the amount of the consideration for, and the terms and conditions of any transfer of the undertaking otherwise than by agreement; and the powers of the Arbitrators and their method of procedure are to be specified. In the event of the consideration or value of the undertaking being settled by arbitration, the Arbitrators are to have regard to the following matters, or some of them: "The condition and state of repair and efficiency of the reservoirs, filter-beds, filtration arrangements, wells, mains, conduits, pipes, machinery, and plant of the Company and the probability of future expenditure thereon, together with any liabilities or obligations in connection with their undertaking which the Company may reasonably be required or expected to incur; the legal powers of the Company to take water, and the probability of such powers being limited; the rights of any other company or body to supply water in the district of the Company, whether as now existing under statute or otherwise, or as may be likely to exist in the future; the adequacy and efficiency of the present sources of supply, and of the reservoirs, filter-beds, filtration arrangements, wells, mains, conduits, pipes, machinery, and plant of the Company to meet present and future requirements; the probable necessity of the future introduction of a new source of supply or new or improved works, the legality of the charges now made or claimed to be made by the Company, together with the circumstances under which such powers of charge have been granted by Parliament; the deductions from any compensation claimed by the Company which may, in the opinion of the Arbitrators, be reasonably made in respect of any insufficiency of the present storeage or filtration of the Company, or in respect of the provision of supplementary supplies, deductions which may be made in respect of works, plant, or appliances which have become wholly or partially useless, and the adjustment of the revenue account of the Company in respect of repairs and renewals properly chargeable thereto; the statutory powers of any other Company to compete in any part of the Company's district; and to prescribe various other matters and things to be taken into consideration by the Arbitrators." No allowance is to be made by the Arbitrators "in respect of any assumed future increase of the rateable value of buildings and hereditaments within the Company's district, other than an increase due to alterations or additions involving an additional supply of water; nor in respect of any part increase in rateable value, except such as shall have been due to alterations or additions involving increased supply of water. Furthermore, no addition is to be made to the fair and reasonable value of the undertaking in respect of compulsory sale. The Bill will extend and supply to the undertaking, with or without modification, any provisions of the Water-Works Clauses Act, 1847, to which the Company are not now subject. So much of the Company's Act of 1852, or any other Act relating to them, will be repealed as excepts from incorporation therewith section 35 of the General Act of 1847; and this section (which relates to the provision of a constant supply of water at high pressure) is to be incorporated in the Company's Acts. The Arbitrators are to have regard to the effect of this repeal and incorporation. The Bill will extinguish any claim of the Company to divide in any year, by way of profits, dividend at any higher rate than that prescribed by their Acts, and, if necessary, repeal any provisions of those Acts under which the Company claim to divide at a higher rate on account of deficiencies of previous dividend. In the event of the terms of transfer being settled by arbitration, the Arbitrators are not to make any allowance in respect of back dividends. The Council are to be empowered to convert by agreement any debentures, debenture stock, or shares or stock of the Company into Metropolitan Consolidated Stock or other security; and they are to have power to redeem and cancel any outstanding debentures, debenture stock, or preference stock of the Company, as from such date and at such price or on such terms as may be defined in the Bill. Power is to be given to the Council for the inspection of the Company's works and accounts, and for making provisions as to the conduct of the undertaking up to the date of the transfer; also in regard to the Company's officers and servants, the disposal and method of paying over any consideration

money to be paid, or stock to be issued, by the Company, the transfer of books, deeds, and documents, and other general and incidental matters. If any claim is made by the Company in respect of any protection against competition afforded by the Public Health Act, 1875, the Arbitrators are to separately assess and determine whether any, and if so, what part of the consideration-money is attributed to such protection. The Bill will contain provisions for the following purposes: "To confer power on the Council on the one hand, and on other County Councils and Urban Sanitary Authorities (with such consents or limitations or exceptions if any as the Bill may define); on the other, to enter into and carry into effect any agreement with respect to the following matters: The sale or transfer to the county or local authority of any part of the undertaking which in the opinion of the Council is not at the time of the sale or transfer required for the present or future supply of water to London, or of any joint right or interest in such part of the undertaking; the lease to the county or local authority of any part of the undertaking, or of any joint right or interest therein or in any part thereof, for such term and on such conditions as may be agreed. The Council are to be authorized to raise money by the creation and issue of consolidated stock to such amount as may be necessary for the purposes of the intended Act, or to use for these purposes or any of them, money standing to the credit of the consolidated loans fund, and to make provisions as to the redemption of such stock or the repayment of loans and the payment of interest or dividend thereon out of the consolidated loans fund and county rate; and to include in their estimates and precepts for the purpose of the county rate such sums as may be requisite for those purposes. Provision will be made that the Council's costs and expenses in the execution of the powers of the intended Act (except so far as they may be otherwise provided for) shall be defrayed as payments for general county purposes within the meaning of the Local Government Act, 1888; and that the costs, charges and expenses of the Council preliminary to, and of and incidental to, the preparing, applying for, obtaining, and passing the intended Act shall be paid by the Council in like manner. Separate accounts are to be kept by the Council in relation to expenditure and revenue in connection with the water undertaking; and provision will be made for charging upon the county rate any deficiency in revenue. The Bill will or may vary and extinguish all powers, rights, authorities, and privileges inconsistent with, or prejudicial to, the carrying into complete effect of any of its objects and purposes, and will confer other rights, powers, authorities, and privileges; and it will also contain the necessary provision for altering or repealing existing Acts.

In the notices referring to the other Companies, it is specified that the County Council may enter into agreements with other councils and urban sanitary authorities with respect to the following matters: "The sale or transfer to the county or local authority of so much of the mains, pipes, and works of distribution of the Company as is exclusively appropriated to the distribution and supply of water within the district of the county or local authority, together with the rights and powers of supplying water therein, and of making charges in respect thereof, which will have been transferred from the Company to the Council; the sale or transfer to the county or local authority of any other part of the undertaking which, in the opinion of the Council, is not at the time of the sale or transfer required for the present or future supply of water to London, or of any joint right or interest in such part of the undertaking; the lease to the county or local authority of any part of the undertaking, or of any joint right or interest therein, or in any part thereof, for such term and on such conditions as may be agreed; the supply of water in bulk to the county or local authority for supply by them within all or any part of their district." The authorities referred to are to be empowered to acquire these portions of the undertakings.

The Attitude of the Surrey County Council on the Purchase Question.

At a recent Meeting of the Surrey County Council—Alderman E. J. Halsey in the chair—the Parliamentary Committee reported, with reference to the proposal of the London County Council to take over the undertakings of the various Metropolitan Water Companies, that at the conference with the London County Council and the authorities interested outside the County of London, the view expressed in the resolution passed at a preliminary conference at the County Hall, that "the water-works, the mains, filter-beds, and means of water supply, supplying water to areas within the Administrative County of Surrey should be acquired by the Surrey County Council in trust for the areas interested," was strongly urged, not only by the Surrey Council, but by the others interested. The representatives of the London County Council were, however, informed that any definite proposals that they might make would receive the most careful consideration of the Surrey Council, but that they declined to take any part in the preparation of any Bills. The Committee recommended that they be authorized to confer with the London County Council upon the basis of the above resolution. Mr. G. P. Bidder expressed cordial concurrence with one point of the resolution mentioned in the report, but with another part he did not see his way at present to concur. It began by stating that it was inexpedient that the water supply of Surrey should be under the control of the London County Council; and there could be no two opinions among them as to that. It went on to say, however, that it should be urged that the water-works, the mains, filter-beds, and means of water supply supplying water to areas within the Administrative County of Surrey should be acquired by the Surrey County Council in trust for the areas interested; and anybody who knew the circumstances—and it so happened that he had more opportunity of knowing the details than most members of the Council—would see that in many cases it would be absolutely impossible to do this. He did not want to see them play into the hands of the London County Council, because he did not like their policy, their motives, or their methods, and the less they had to do with them the better. Alderman Guilford said what they asked the Council to do was to retain the source of the supply of the county of Surrey in their own hands. If they allowed it to be taken from the county, and did not secure a supply for themselves, they would be wanting very much in their duty. It was simply proposed that the Parliamentary Committee should watch the proceedings of the London County Council; and the recommendation was adopted.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of October.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 192,939,209 gallons, as compared with 188,788,084 gallons in the corresponding month of 1893. The number of services being 810,438, the rate was 238 gallons to each service. Of the entire bulk of water sent out, 101,066,742 gallons were drawn from the Thames, and 91,872,467 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: Taking the average amount of organic impurity in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·6; New River, 1·1; Tottenham, 1·3; East London (deep well), 1·4; Colne Valley, 1·6; East London (river supply), 2; Grand Junction, 3·1; West Middlesex and Southwark, 3·2; Chelsea, 3·3; and Lambeth, 3·6. The unfiltered river waters contained the following proportions: Thames at Hampton, 4·7; New River Cut, 1·8; and the Lea at Angel Road, 3·1. The Thames at Hampton was, on the 10th of October, both in appearance and chemical quality, exactly similar to its condition on the 7th of September; but bacterially it was not quite so good. As delivered by the five Companies drawing from this river, it was in every case efficiently filtered, and greatly improved in chemical quality. The bacterial improvement effected by the various Companies is expressed by the following percentage numbers: Chelsea (average of three samples), 99·76; West Middlesex, 99·63; Southwark, 99·79; Grand Junction (average of two filters), 98·71; and Lambeth (average of three filters), 99·55. The raw river water of the Lea above Hertford was on the 12th of October of better bacterial quality than on the 8th of September, but still much inferior to the condition of the same river lower down at Angel Road (the intake of the East London Company); but even at the latter point, the Lea water was bacterially inferior to the Thames at Hampton. The water of the Chadwell Spring contained, for spring water, an abnormally large number of microbes. The admixture of the Chadwell Spring with the raw Lea water reduced the number of microbes per cubic centimetre to one-half; and the subsequent flow through the New River Cut and storage reservoirs further reduced the number in the mixture to one-fourth. After this storage, but before filtration, the water of the New River Cut was turbid and very pale yellow; but it was chemically of very good quality, and was efficiently filtered before delivery. The bacterial improvement effected by flow, storeage, and filtration was 99·75 per cent.; and by filtration alone, 99 per cent. As delivered to the consumers, the New River Company's supply ranked with the deep-well waters in respect of organic purity. The water taken from the Lea at Angel Road by the East London Company was turbid and pale yellow in colour. It was of fairly good chemical quality, efficiently filtered before delivery, and greatly improved in respect of organic purity. The bacterial improvement amounted to 97·71 per cent. The deep-well waters of the Kent and Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were clear and bright without filtration. These waters were all of a high degree of organic purity, and were of excellent quality for dietetic purposes. The Colne Valley Company's water was softened before delivery, and thus rendered suitable for washing. Seen through a stratum 2 feet deep, the Kent and Tottenham waters were clear and colourless; the New River, Colne Valley, and East London (deep-well), clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacterioscopic examination of the raw river water before and after storeage, of the unfiltered gravel water utilized by the Southwark Company, and of the supplies of the various Companies, collected on the 9th, 10th, 11th, and 13th of October, gave the results contained in the following table:—

Description.	No. of Microbes per Cubic Centimetre.	Temperature in Deg. C.
Raw and Gravel and Stored River Waters.		
Thames at Hampton	3,800	12·3
„ after storeage for 14·7 days (Chelsea Company)	520	12·5
Gravel water (Southwark Company)	60	13·7
Lambeth water before filtration	260	—
Lea at Hertford	8,060	12·4
New River, Chadwell Spring	1,940	12·4
Mixture of Lea water and Chadwell Spring	4,060	12·6
New River Cut at entrance to reservoirs	2,520	12·7
„ „ just before filtration	1,000	13·0
Lea at Angel Road	4,920	13·5
„ after storeage for 15 days	880	13·5
Filtered River Water as Supplied.		
Thames—		
Chelsea, general filter well at 1.45 p.m.	8	12·4
„ „ „ 2.30 „	12	12·4
„ „ „ 3.45 „	8	12·4
West Middlesex	14	12·3
Southwark, No. 4 filter	8	12·4
Grand Junction, general well at Hampton	52	14·2
„ „ „ Kew Bridge	46	13·3
Lambeth, general filter well at 12.15 p.m.	16	12·5
„ „ „ 2.40 „	14	12·3
„ „ „ 3.50 „	20	12·3
Lea—		
New River	10	12·7
East London, No. 1 Essex well	14	13·3
„ No. 2 „	16	13·3
„ Middlesex well	12	13·3
Deep Well—		
Kent, new well at Deptford	4	11·3

In their report to the Official Water Examiner (Major-General A. de Courcy Scott, R.E.) on the composition and quality of the water

supplied to London during the past month, as ascertained by tests of samples taken daily on behalf of the Companies, Professors Crookes and Dewar state that of the 189 samples examined, 7 were recorded as "clear, but dull;" the remainder being clear, bright, and well filtered. In their general remarks upon the supply, they say: "The rainfall during the month of October, at Oxford, representing the Thames Valley, has been 3·97 inches; and as the 25-years' mean for the month is 2·56 inches, it follows that there has been an excess of rain amounting to 1·41 inch. Most of the rain fell at the latter part of the month; no less than 3·27 inches falling on five days (the 24th, 26th, 27th, 28th, and 30th), the rest of the month only having 0·7 inch of rain. The effect of so much sudden downpour is to wash a certain amount of clay into the river from the adjacent country, and thus introduce suspended matter into the water. So far the filtering arrangements of the respective Companies have been well able to cope with the additional strain thereby put upon them. The Grand Junction water, at the beginning of the month, was not perfectly clear. Some of the filter-beds at the Hampton works are in course of partial reconstruction, causing a disturbance of the filtering medium. We have therefore temporarily discontinued drawing samples from the Uxbridge Road for analysis, and have taken them from a stand-pipe in Kensington Park Road. Analysis shows that the turbidity is not caused by excessive organic impurity, but by purely inorganic and harmless matter. The efficiency of filtration, as regards the security of the public against any possibility of water pollution, is proved by the bacteriological examinations of the waters, which have been carried on during the last month. These show that the Grand Junction waters, as well as those of the other Companies, were practically free from microbes. In the least clear sample of water drawn direct from the stand-pipe at Shepherd's Bush into a sterilized tube, there were detected only 20 colonies per cubic centimetre after cultivation for 48 hours in nutritive gelatine."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Falkirk Corporation are not coming to their senses yet. In their last interdict—that relating to the appointment of Mr. Barr as Oversman in the arbitration—Lord Low having refused to remove him, the Corporation have appealed to the First Division of the Court of Session. They waited the full time of eight days in which they may appeal, as they said, to see whether Mr. Barr would, of his own accord, withdraw from the appointment; and then, not having heard from him, they lodged their reclaiming note. At the request of Counsel for the Gas Company, their Lordships agreed to put the case down for hearing on an early day. I understand it is to be heard next week. Of course, now when it is appealed, and until disposed of, the three months allowed for the arbitration do not run; but the eight days which the Corporation waited before lodging their appeal come off the three months, and every day off now makes it more difficult for the parties getting the arbitration concluded within the three months allowed.

The Forfar Corporation Gas-Works are beginning to see better days. It was reported this week to the Corporation that the output of gas during the past month showed an increase over the corresponding month of last year of 314,000 cubic feet. Mr. Forbes Waddell, the newly-appointed Manager, preferred a request to be allowed to prepare and submit a report upon the condition of the retort-house, in which he might inform the Commissioners as to what alterations might be necessary to enable him to economize both labour and fuel. This request was granted.

Amalgamation and unification are in the air just now. Dundee has just completed a scheme whereby all the municipal bodies in the city have been merged in one—the Town Council; and this week parliamentary notices are published of a Bill which the Corporation of Glasgow are about to promote, in which, among a variety of other subjects, power is to be asked to amalgamate all the powers which are exercised by the Council and the Police Commissioners in connection with the various Trusts which they administer. These include the Gas Trust and the Water Commission, which are at present separate establishments, though part of the Corporation. I suppose the intention is to have the whole of the undertakings for which the ratepayers are responsible in the hands of, or under the control of, the Town Clerk. I can see no other motive for the change, unless it is economy in administration, because practically the same Commissioners or Trustees will sit. There will, of course, be greater freedom of action for the Commissioners or Trustees, in respect that gas, water, or other business, will be competent at any meeting of the Corporation, and not, as at present, only at meetings of the particular Trust or Commission called for the purpose.

Incandescent gas lighting is taking a very firm hold in Scotland. Both in Edinburgh and in Glasgow, where I have the best opportunities for seeing it, it is surprising to note the large number of places of business where it has been introduced; and the great advantage it confers in the matter of lighting is apparent to all. In Leith, the Police Commissioners have resolved to double the number of lamps they are using in street lighting, which shows that they are satisfied with it. Perhaps as telling an illustration as I know of its advantages came under my own experience the other night, at a large public banquet. The apartment was formerly lighted by 72 burners, each consuming 5 cubic feet of gas per hour; and the effect was very good. Now it is much better lighted by 41 incandescent gas-burners; while the saving in gas is more than 200 cubic feet per hour.

The gas-meter trade in Edinburgh is extremely busy; the chief demand being for prepayment meters. Messrs. W. and B. Cowan are working almost night and day to fulfil large orders which they have recently secured. I hear that one large firm in the city, are about to open a branch establishment in Bradford, to supply their English customers, of whom they have a large and increasing number.

One of the advantages of using gas for lighthouse purposes is that the supply can be stored, and regulated by clockwork; thereby doing away with continuous personal attendance. A lighthouse, built upon the Oxcar rock, in the Firth of Forth, has been fitted with appliances for this method of lighting; and this week, the plant having been found to work satisfactorily, three men who were formerly kept in the lighthouse to look after the oil light have been removed. It is now only necessary to visit the lighthouse once a fortnight, to replenish the gas supply and wind up the regulating appliance.

The system of sewage treatment which was this year adopted by the Glasgow Corporation is giving satisfaction, as is evidenced by the reports of Mr. Tatlock, the City Analyst, upon the effluent. It is found, also, that the cost of working is decreasing. The report by Mr. Melvin, the Manager, for the past quarter, shows that the cost of treatment per million gallons was £3 11s. 3d., as against £3 14s. 2d. in the preceding quarter. It is expected that a still further reduction will be effected.

The water supply of Arbroath is not on a very satisfactory footing; and for some years the Town Council have been seeking a means for providing a better supply. That they have need to be energetic in the matter, was shown this week, when, in consequence of the fracture of a water-main—attributed to a road-roller—the town's water supply was all but exhausted; the storeage-tank, before the main could be repaired, being emptied to within a foot of the bottom. The water supply is obtained by pumping from a well.

Sulphate of ammonia has been sold recently at £11 17s. 6d. per ton for present delivery, and at £12 6s. 3d. per ton for delivery between January and March. It is reported that there is an almost complete absence of demand; and that the deliveries, which are principally of the variety obtained in iron-works, were so much delayed by the miners' strike that large quantities which should have been obtained in August and September are being forced upon purchasers who have no outlets, so that prices threaten to be lower still.

It cannot be said that the coal trade in Scotland is in anything like a satisfactory position. Last week I mentioned that the miners were to be asked by their leaders to agitate for an increase of wages by 6d. per day. This was a foolish proposal, when all the circumstances are taken into account; and the miners themselves have seen it to be so, for in no district have they responded to their leaders' suggestion. The foundation of the claim, however, was the high price which coalowners were charging. The movement is now from the opposite quarter. Manufacturers, it is announced, find it impossible to get foreign orders, or even, in many cases, to compete at home with producers outside of Scotland; and some are threatening to close their works. This is said to be the case with those who furnish shipbuilding materials. In these circumstances, the coalowners have this week let down the price of coal by from 9d. to 1s. per ton. This may bring relief, in which event the outlook would at once improve. But suppose (which is not impossible) that coalowners should, imagining that they have the miners at their feet, resolve to impose a reduction of wages upon their workmen, the question is whether they would submit to it. I rather think they would be powerless to resist the reduction; but there would be further industrial disturbance. There is another possibility—namely, that manufacturers should not get relief by the present reduction in the price of coal, and should be told by the coalowners, on their asking for more, to find their remedy in reducing the wages of their own workmen. In that case, there would be a much more widespread, and therefore much more serious, industrial war than if only the miners were engaged with their masters. The outlook is not very reassuring. It would almost seem as if very serious trouble is ahead for our industrial population, because of the necessity for cutting down prices consequent upon the increasing keenness of foreign competition in the markets of the world.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 24.

Sulphate of Ammonia.—Although it cannot be said that there has been an entire absence of demand, it has been of such a desultory character that some ground has been lost as far as prices are concerned. Even at this late period of the month, it may be there are some undivulged wants which may yet develop and stimulate the market; and although there is still not a great quantity offering, so long as it is more than sufficient to supply the demand, an improvement in prices is not within reach. Certain it is that the existing dearth of orders is inexplicable; and in the present unsettled condition of things, consumers merely purchase when necessity compels them, and remain inert in regard to future engagements. The nearest value at which business is possible may be said to be £11 17s. 6d. Nitrate is quiet at 8s. 9d.

LONDON, *Nov.* 24.

Tar Products.—Pitch continues to realize the excellent prices that have been prevailing for the last two or three months; and tar distillers are lamenting having sold much of their season's productions before the advance came about. Benzols are weaker; large buyers declaring that the price will have to go lower before important contracts for the next year are closed. Solvent naphtha is nothing like so good as it was; the effect being that crude naphtha is now offering at the remarkably low price of 5d. per gallon. Carbolic acid is in fair inquiry; but the price is not strong. Cresylic acid is practically unsaleable. There is a little better demand for liquid creosote for lighting purposes; but ordinary creosote is flat and unsaleable—the renewal of blast-furnace operations in Scotland again bringing furnace oils in large quantities on to the market. This week's values are as follows: Tar, 17s. to 21s. Pitch, prompt, 40s.; forward, 35s. Benzol, 90's, 1s. 1d.; 50's, 1s. 1½d. Solvent naphtha, 1s. 2d. Toluol, 1s. 2½d. Crude naphtha, 5½d. Creosote, liquid, 2½d.; ordinary, 1⅞d.; salts, 20s. Cresylic acid nominal, refined, 1s.; brown, 9d. Carbolic acid, 60's, 1s. 5d. Anthracene, "A," 1s. 1½d.; "B," 10d.

Sulphate of Ammonia.—This market is very much disturbed; and the sudden collapse in prices has caused buyers to hold off meantime. Sales during the week have ranged between £11 18s. 9d. and £12 1s. 3d. in all positions, less 3¼ per cent.; while gas liquor is quoted at 7s. to 10s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Extreme depression continues throughout the coal trade of this district, with a decided weakening tendency in prices. Even the best qualities for house-fire purposes are scarcely maintaining quoted rates, owing to surplus supplies being pushed on the market at specially low figures, to effect clearances. Best Wigan Arley coals, except for small special sales, do not average more than about 10s. 6d. per ton at the pit. Pemberton four-feet and seconds Arley, about 9s. 6d. to 10s.; and common house coals, about 7s. to 8s. The lower qualities of round coal, for general industrial requirements, also continue very difficult to dispose of, owing to the restricted demand for iron-making and other manufacturing purposes. Ordinary steam and forge coals can be readily bought at from 6s. 6d. to 7s. at the pit mouth; with ordinary steam coal for shipment, delivered at the ports on the Mersey, at from 8s. to 8s. 6d. per ton. Engine fuel, notwithstanding the restricted demand for round coal, is still a general drug upon the market; and the stoppage of a considerable portion of the works owned by the United Alkali Company, Limited, owing to the depressed condition of the chemical trade, will of course throw upon the market very considerable quantities of slack. All sorts of prices are being taken, either to secure contracts or to effect sales of any weight. Good ordinary Lancashire slack has been sold at as low as 3s. per ton at the pit mouth; and quotations do not average more than about 3s. 6d. to 4s. 6d. and 5s., according to quality. Slack from outside districts continues to be offered here at prices which barely leave more than 1s. 6d. per ton at the pit. Collieries throughout the district continue on short time; and it is only in exceptional cases that pits are able to run more than about four days per week.

Northern Coal Trade.—The coal trade of the North-east has received a slight impetus, and the working of the collieries has been rather more regular of late; but all the steam coal pits have not full work yet, nor is this probable now that the Baltic ports are closing. Naturally, at this time of the year, the dulness is most noticeable in steam coals; and the price of this class has been affected more than that of other kinds. Best steam coal from Northumbrian pits have been sold at less than 9s. 6d. per ton in exceptional cases; and generally the quotation is now from 9s. 6d. to 9s. 9d. per ton f.o.b. Second-class steam coals may now be had at 9s. per ton; and steam smalls are a little easier in price, being quoted at 4s. 3d. to 4s. 6d. per ton. In regard to gas coals, there is a continued competition between the collieries in the combination and those out of it; and the former complain seriously of the latter handicapping them by taking contracts at a price just below that quoted by the associated collieries. The latter still ask from 7s. 3d. to 7s. 9d. per ton f.o.b. for best gas coals; whilst some of the unassociated collieries quote very slightly below. The demand for gas coals is now a very heavy one; and the deliveries are on a commensurate scale, so that the pits are fairly well occupied, except when a storm deranges the steamers that take the large coasting contracts. Household coals are quiet; the mild weather limiting their use. Manufacturing coals are being contracted for over next year, and generally at prices slightly below those that have ruled this year. Coke is only quiet; the demand for export being rather below the recent average. The price for best blast furnace kinds is from 13s. to 13s. 6d. per ton f.o.b. Negotiations are now in progress for the sale of large quantities of gas coke on contract for next year; and it seems to be the expectation that these contracts will be agreed upon at rates from 6d. to 8d. per ton below those that ruled this year.

Scotch Coal Trade.—A period of dulness threatens to succeed the great activity of the past few weeks, attributable to the fact that most of the running contracts have been executed and manufacturers find prices too high to warrant them contracting at present. There is also little foreign demand, for the same reason. Coal is therefore accumulating at pit-heads. Prices have this week gone down, in some cases as much as 1s. per ton. In Fifeshire circulars have been issued by coalowners intimating a reduction of 9d. per ton upon shipping rates. There is a plentiful supply of splint coal; and sellers are eager to get it away, upon terms which are easy compared with what they have been. Ell is in less request, in consequence of the practical cessation of shipments to the Baltic and keen competition from Tyne collieries for the Mediterranean trade. The prices quoted are main, 7s. 6d. to 7s. 9d.; ell, 8s. 3d. to 8s. 6d.; splint, 8s. 6d.; steam, 8s. 9d. to 9s. per ton f.o.b. Glasgow. For the week, the shipments have been 151,901 tons—an increase on the previous week of 454 tons, but a decrease as compared with the corresponding week of last year of 21,245 tons. For the year to date, the total shipments have been 4,510,646 tons—a decrease as compared with the corresponding period of last year of 2,606,251 tons.

The Launceston Water Arbtiration.—The Arbitrator (Mr. F. W. Dymond) appointed to investigate the claims of Messrs. Pearn and Climo, the owner and occupier respectively of a mill on the banks of a stream at Bray Down, for compensation for an interference with their rights, owing to the water being drawn upon for the supply of Launceston, as mentioned in the JOURNAL last week (p. 988), has made his award. Mr. Pearn's claim was for £540. He was offered £250 by the Corporation; and this sum has been awarded. Mr. Climo asked for £670; and Mr. Dymond has given him £230. The Corporation have to pay the costs.

An Important Water-Rate Decision at Bilston.—A case affecting a large number of ratepayers in Bilston was heard at the Police Court last Tuesday, when Jonas Colley, of Wellington Road, was summoned, at the instance of the Improvement Commissioners, for the non-payment of a water-rate, amounting to 6s. 3d. The claim was for a rate of 4s. 2d. levied for water supplied to defendant's house, and 2s. 1d. for a supply to a closet. The defence was that there was no extra supply to the closet, as Mr. Colley had erected a patent waste-water closet, by which the water supplied to the house was utilized. It was explained that upwards of 11,000 of these closets were in use, and that in no instance had a similar claim been substantiated. The 4s. 2d. was not in dispute. The Stipendiary (Mr. Neville) dismissed the claim for 2s. 1d., and allowed the defendant's solicitor's fee.

Leicester Water Supply.—There is considerable further improvement in the condition of the Leicester water supply. The stock of water on the morning of the 15th inst. was 216 million gallons; on the 22nd, it was 274 million gallons—an increase of 58 million gallons. At the latter date, the Thornton reservoir was 12 ft. 6 in. below the weir; the Bradgate reservoir, 14 ft. 7 in. below the weir. The deficiency in stock was 615 million gallons; the deficiency on the corresponding day last year being 735 million gallons.

Cape Town District Water-Works Company, Limited.—At the meeting of this Company to-morrow, the Directors will present a report in which they state that the gross revenue, which amounted last year to £7499, has increased to £10,411; and the sales of water, from £6074 to £9022. In this sum, however, is included £1000 for a temporary supply to Cape Town; leaving £1948 as the increase in the ordinary revenue. The net profit for the year is £2027, to which is added the credit balance at June 30, 1893, £242; making a total credit of £2269, which the Directors propose to deal with as follows: Transfer to reserve account, £800; payment of a dividend of 1 per cent. per annum on the share capital, £800; and carry forward to next year the balance of £669.

The Belper Local Board and the Water-Works.—At the offices of the Belper School Board, on the 17th inst., Mr. G. Waller Willocks, M.Inst.C.E., held an inquiry respecting the application made by the Belper Local Board for power to purchase the undertaking of the Belper Water Company. The two parties have come to terms through their Arbitrators. The price fixed is £11,105; and the costs come to £344 16s. Application was made to borrow £11,700; and there was no opposition on the part of the inhabitants. The Company was established in 1860, with a capital of £7500; but the actual expenditure was £13,970, owing to claims for water rights and compensation. The whole of the money was spent. There was expended out of the revenue £2870, which should have gone for dividend. Until 1880 no dividend was paid; and in the last 15 years it had been at the rate of 5 per cent. There were practically no working expenses. Mr. Hodson, the Arbitrator for the Board, was the only gentleman who gave evidence, beyond Mr. Pym, the Clerk to the Board, proving the necessary details. Mr. Hodson said the water was good; and the Board would, in his opinion, make an excellent bargain. Mr. Pym said the annual assessable value was £32,960 for poor-law purposes; and for the Public Health Act, £24,307. There were no debts. An agreement had been entered into by the Board and the Company. The works were stated to be good after 30 years' wear and tear.

Additional Storeage at the Ryde Gas-Works.—Owing to the development of the town of Ryde, and the resulting increased demand for gas, the Gas Company have been compelled to increase their storeage by the provision of an additional gasholder. On the advice of their Engineer (Mr. G. Garnett), the work was entrusted to Messrs. S. Cutler and Sons, of Millwall, who have lately completed their contract well within the allotted time; and the holder was inspected by the Directors and a number of other gentlemen, including the Mayor (Alderman Ellery), on Monday of last week. The party assembled in the Board-room at the gas-works, and then proceeded to inspect the holder, which is telescopic, and has been constructed with Messrs. Cutler's spiral system of guide-framing, and furnished with their patent device for preventing the freezing of the water in the cups or tank. The latter is of steel, standing upon a bed of cement concrete; and for the greater part of its depth, it is above the ground. The holder had been inflated with air; and on this being liberated, the vessel gradually sank into its tank in a satisfactory manner. The party were then conveyed to the Royal Pier Hotel, where luncheon was provided by the contractors. In the course of the proceedings, Mr. Garnett gave an interesting account of his own and Messrs. Cutler's connection with the Ryde Gas Company, and complimented the firm on the excellent way in which they had carried out their work, in spite of strikes and bad weather, without a single penny for extras. He also referred to the able assistance rendered to him by Mr. Farrand in the supervision of the erection of the holder, and thanked him for what he had done. Mr. Cutler also acknowledged Mr. Farrand's services, as well as those of Messrs. Coombes and Perkins, in connection with the work. On the previous Friday, the completion of the holder was celebrated by a dinner to the workmen of the Contractors and the Gas Company.

The Recovery of Water-Rates.—At the North London Police Court last Thursday, Mr. Lushington attended specially to dispose of the case of *The East London Water-Works Company v. Kyffin*. The Company had summoned Mr. Kyffin, a prominent member of the Hackney Vestry, and an extensive property-owner in the district, for two quarters' water-rent due upon nine houses in Balcorn Street, South Hackney. While the case was before the Court, another half-year's water-rent became due under the Company's powers to claim in advance. The defence was that neither of the rates could be claimed, because six months had elapsed between the demand and the issue of the summons in the case of the first half year, and because no demand had been made for the second half year claimed for. Mr. Lushington decided for the defendant on both points, and dismissed the summonses. The Company appealed; and the Divisional Court sent the case back to the Magistrate for decision (see *ante*, p. 829). His Worship now said that, as the Judges had decided he was wrong, he had to give judgment in favour of the Company for half the amount claimed originally—viz., £4 4s. 6d.—and the costs of the appeal. In disposing finally of the case, he remarked that he was somewhat surprised at the judgment of the High Court. He had no right to say that the Judges were wrong; but it seemed to him that the effect of the judgment was far-reaching. The law, however, was now made clear to the whole of the consumers; and it amounted to this—that if a man entered into the possession of a house at the half-quarter, and did not within a few hours ascertain and pay the charges of the water company, he was liable to be summoned to a criminal court for default, and to be made to pay the rate and costs. If such a state of things had been brought about by a company's bye-law, such bye-law would have been rejected as unreasonable. But this was no bye-law—it was the law of the land; and it was necessary that everybody should know of these powers as soon as possible.

The Finances of the Salford Corporation.—A special meeting of the Salford Town Council was held on Monday last week, to consider the advisability of applying to the Local Government Board for a Provisional Order for authority to borrow money to adjust the adverse financial balances, in accordance with a motion of which notice had been given by Mr. Sharrocks. This gentleman stated that the secret of all their trouble was that they allowed the business of the Council to be managed for them instead of managing it themselves. It was the officials who were the masters. The Chairmen of the various Committees did not take such a stand as they ought to do in order to keep the Council in a proper position before the community. He attended as much as he could at the Local Government Board inquiry recently held (*ante*, p. 934); and, after hearing the remarks made by Mr. Burd, one of the Inspectors, he felt that it would be far better for the Council to at once make a clean breast of the whole matter, and having got right to see that they kept so. He moved—"That application be made to the Local Government Board for power to borrow an amount sufficient to cover all the deficit balance owing by the Corporation up to March 25 next." Mr. Frankenburg proposed, as an amendment, that the words "up to March 25, 1894," be substituted for "up to March 25 next." This, however, was rejected; and the motion was carried with the addition of the words "and that the Finance Committee ascertain the amount."

Unlawful Consumption of Gas.—At the Hull Police Court last Tuesday, before Mr. Twiss, Charles Rosendale, a whitesmith, carrying on business at 7, Medley Street, was summoned, at the instance of the British Gaslight Company, for laying a pipe to connect with the service-pipe of the Company, for the purpose of obtaining an illegal supply of gas. Mr. Lowe, who appeared for the prosecution, said that on the 8th inst. one of the inspectors of the Company visited defendant's premises for the purpose of examining the gas-meter, when he noticed the service-pipe had been tapped before reaching the meter. He reported the matter to the chief inspector, Mr. Warren, who, visiting the defendant's premises, found a pipe had been connected to the Company's pipe in the cellar beneath the defendant's shop. The pipe came through the floor above a bench to a bracket; the connection being concealed by a piece of board and some tools. Rosendale admitted to Mr. Warren that he made the connection in September last. Defendant had rendered himself liable to a fine of £5 and costs. Mr. Warren was called in support of the above statement; and he produced a model of the premises, showing the connection. Dr. T. C. Jackson, who represented Rosendale, admitted the offence, and said defendant expressed sincere regret for what he had done. He had been in difficulties; and the idea was suggested to him, in a moment of temptation, as a means of reducing his expenses. Mr. Twiss said it was a very lamentable and grievous case; and therefore he should impose the full penalty of £5 and costs, and allow a solicitor's fee.

New Water Scheme for Barnsley.—A special meeting of the Barnsley Town Council was held on Wednesday last—the Mayor (Alderman Woodcock) in the chair—to consider the proposed extension of the water-works. Alderman Raley moved a resolution, declaring it expedient for the Corporation to promote a Bill in Parliament next session to empower them to obtain a further supply of water from certain tributaries of the River Porter, or Little Don, at or near Upper Midhope. The Water Committee, he said, had consulted Mr. Charles Hawksley, who had advised them that, by the construction of the Midhope reservoir, they would be able to obtain 1,800,000 gallons per day, at a cost of £146,000. This water would be conveyed to the covered service reservoir, outside the west boundary wall of the Wortley Park, and thence along the old Sheffield Road to Barnsley. The outlay on the works, with the cost of promotion, would probably be £170,000. He compared this scheme with others which had been proposed, and said that by the year 1905 the cost of the new works would be more than recovered by the income derived from the out-townships, and by taking on the township of the Hemsworth Rural Sanitary Authority. If this scheme was not adopted, they would have to cut off the out-townships, which would mean the immediate withdrawal of £4000 a year from the general district rate; and as they would have to extend, for the borough alone, in ten years, at a probable cost of from £100,000 to £200,000, or an annual expenditure of about £10,000, there was no alternative but to go on with the scheme now suggested. Dr. Halton seconded the motion, which was carried.

Water Companies' Liabilities.—In the Durham County Court, on Tuesday last, before Judge Meynell, Mr. George A. Worley, a draper, of Cornsay, sought to recover £40 12s. from the Consett Water Company, damages alleged to have been sustained by him owing to their negligence. The plaintiff's case was that, about ten o'clock on June 15 last, he was driving home from Lanchester to Cornsay; and when passing through Ford Lane, his horse stumbled into a trench, which had been dug in the road for the purpose of laying water-pipes for the Company. It was the duty of the Company, when opening up a public road, to see that the hole they made and the obstruction they caused were protected during the night by a light. There was no light on the night in question; and the trench ended at a point where there were trees on both sides of the lane, so that there was nothing to show that any obstruction was there. Fortunately, the plaintiff and the trap were not hurt; but the horse was injured—the flesh on the hind leg being torn to the bone; and it had never been able to work since. Plaintiff did not, of course, claim for the horse's sufferings; but he claimed 8s. a week for 20 weeks in respect of loss of cartage, 9s. 6d. a week for the horse's keep and attendance, 22s. veterinary surgeon's fees, and £22 for depreciation in the value of the horse. He had claimed compensation from the contractors who were carrying out the work for the Company; but they denied liability. He had offered to go to arbitration, but this was refused; and therefore he brought the action. Evidence having been given by the plaintiff, the Company's representative said it was useless to deny that there should have been a light at the spot, and that the place was not well protected. He submitted, however, that the plaintiff had exaggerated all the circumstances, and particularly the damages. Evidence was then submitted on behalf of the Company. In the result, his Honour gave judgment for the plaintiff for £21 2s.

Gainsborough Water Supply.—The Gainsborough Local Board of Health have now received the sanction of the Local Government Board to a loan of £5750 for their proposed new boring. This will be somewhat remarkable, on account of its great diameter and depth. It is to be 1450 feet deep, and not less than 18 inches in diameter in the sandstone; and it will take the best part of two years to execute. The whole scheme as designed by Mr. Jabez Church, M.Inst.C.E., has been approved by the Local Government Board; and as soon as the new boring is sufficiently advanced to confirm the Engineer's opinion as regards the quantity of water to be obtained from it, the remainder of the amount applied for will be at once sanctioned, in order to complete the scheme. As regards the probable success of the new borehole, it will be situated only a few yards from the one now supplying all the water required by the town; and it will be carried 600 feet lower than this, and be 18 instead of 10 inches minimum diameter. Consequently, there cannot be any doubt that the new supply will prove ample for the needs of the town for many years to come.

The Thames Conservancy and the Pollution of the River.—A statement has been prepared and formally adopted by the Thames Conservancy Board as to the provisions of the Thames Conservancy Act, 1894, which relate to pollution, together with proposals for carrying the same into effect. It is pointed out that the area under which the jurisdiction of the Conservators is to be exercised with respect to pollution above the western limit of the Metropolis is increased by the Act from 1743 to about 3800 square miles. The new income provided by the Act is £7500 per annum, to be contributed by the Metropolitan Water Companies, in addition to their present payments. Of this amount, £1000 is to be carried to the Lower Navigation fund, and £6500 to the Upper Navigation fund. These funds are to be kept separate, and one-fourth of the Conservancy establishment charges of at least £12,000 a year is to be defrayed by the Upper Navigation fund. It has been decided that in future the Board shall have seven inspectors, each with two subordinates—one an assistant-inspector, the other a workman—to aid in obtaining and forwarding samples. The question of the inspection of the river below the western limit of the Metropolis is not dealt with in the statement.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see *ante*, p. 1016.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	**GAS COMPANIES.**				£ s. d.
590,000	10	1 Oct.	10½	Alliance & Dublin 10 p. c.	10	19–20	..	5 5 0
100,000	10	,,	7⅞	Do. 7 p. c.	10	13–14	..	5 7 2
300,000	100	2 July	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 4
220,000	5	14 Nov.	6¼	Bombay, Limited	5	6–6¼*	..	5 0 0
40,000	5	,,	6¼	Do. New	4	4⅞–4¾	..	5 9 6
380,000	Stck.	15 Aug.	11½	Brentford Consolidated	100	230–235	..	4 17 10
180,000	,,	,,	8½	Do. New	100	183–185	..	4 11 10
220,000	Stck.	28 Sept.	11	Brighton & Hove Original	100	215–220	..	5 0 0
888,500	Stck.	30 Aug.	5	Bristol	100	115–120	..	4 3 4
320,000	20	28 Sept.	11¼	British	20	48½–49½	..	4 10 10
50,000	10	30 Aug.	11½	Bromley, Ordinary 10 p. c.	10	11½–22½	..	5 2 2
31,510	10	,,	8¼	Do. 7 p. c.	10	16¾–17¾	..	4 17 2
328,750	10	14 Nov.	2	Buenos Ayres (New) Limited	10	6¾–7*	..	2 17 1
800,000	100	2 July	6	Do. 6 p. c. Deb.	100	101–101½	..	5 15 5
150,000	20	12 July	8	Cagliari, Limited	20	25¾–26¾	..	6 0 8
550,000	Stck.	11 Oct.	13	Commercial, Old Stock	100	467–472	..	4 15 7
165,000	,,	,,	10	Do. New do.	100	195–202	..	5 0 0
160,762	,,	14 June	4½	Do. 4½ p. c. Deb. do.	100	134–137	..	3 5 8
800,000	Stck.	14 June	13	Continental Union Limited	100	242–247	..	5 5 3
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	210–213	..	4 13 0
535,000	Stck.	30 Aug.	5	Crystal Palace Ord. 5 p.c. Stk	100	115–120	..	4 3 4
486,090	10	27 July	11	European, Limited	10	22⅞–23⅛	..	4 13 7
354,080	10	,,	11	Do. Partly paid	7	16–17	..	4 17 1
5,646,590	Stck.	15 Aug.	12	Gaslight & Coke, A, Ordinary	100⅛	248–252	..	4 15 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	105–110	..	3 12 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	277–282	..	3 10 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130–135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	180–185	..	3 15 8
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	275–280	..	3 11 5
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165–170	..	3 10 7
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	128–131	+1	3 1 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	135–140	+3	3 4 3
908,000	,,	,,	6	Do. 6 p. c. do	100	183–187	+2½	3 4 2
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	225–230*	..	5 4 4
75,000	5	14 June	6	Malta & Mediterranean, Ltd.	5	5–5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	110–112	+1	4 9 3
541,920	20	14 Nov.	5	Monte Video, Limited	20	15–16*	..	6 5 0
150,000	5	30 May	8	Oriental, Limited	5	6¾–7⅛	..	5 6 8
60,000	5	13 Sept.	7	Ottoman, Limited	5	4⅞–4¾	..	7 7 4
166,870	10	31 Jan.	2	Park Limited	10	1½–2	..	10 0 0
480,000	100	2 Nov.		People's Gas of Chicago—1st Mtg. Bds.	100	100–105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98–103	..	5 16 6
150,000	10	11 Oct.	6	San Paulo, Limited	10	9–9⅛	..	6 6 4
500,000	Stck.	30 Aug.	15½	South Metropolitan, A Stock	100	337–342	+2	4 10 8
1,350,000	,,	,,	12	Do. B do.	100	282–287	..	4 3 7
260,000	,,	,,	13	Do. C do.	100	290–295	..	4 8 1
750,000	,,	12 July	5	Do. 5 p. c. Deb. Stk.	100	157–162	+1	3 1 9
60,000	Stck.	30 Aug	11½	Tottenham & Edm'nton, "A"	100	220–225	..	5 2 2
				WATER COMPANIES.				
746,011	Stck.	28 June	10	Chelsea, Ordinary	100	290–295	+2	3 7 10
1,719,514	Stck.	11 Oct.	8	East London, Ordinary	100	230–235	..	3 8 1
634,740	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	152–156	+2	2 17 8
700,000	50	14 June	8½	Grand Junction	50	120–124	..	3 8 7
708,000	Stck.	15 Aug.	12	Kent	100	304–309	+2	3 17 8
1,043,800	100	28 June	9½	Lambeth, 10 p. c. max.	100	270–274	..	3 9 4
406,200	100	,,	7½	Do. 7½ p. c. max.	100	209–214	..	3 10 1
330,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	132–135	..	2 19 3
500,000	100	15 Aug.	12½	New River, New Shares	100	384–388	..	3 2 6
1,000,000	Stck.	27 July	4	Do. 4 p. c. Deb. Stk	100	140–145	..	2 15 2
902,300	Stck.	14 June	6	S'thwk & V'xhall, 10 p. c. max.	100	170–175	+2	3 8 7
126,500	100	,,	6	Do. D 7½ p. c. do.	100	160–165	+3	3 12 9
1,155,066	Stck.	14 June	10	West Middlesex	100	280–284	+1½	3 10 5

*Ex div.

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HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

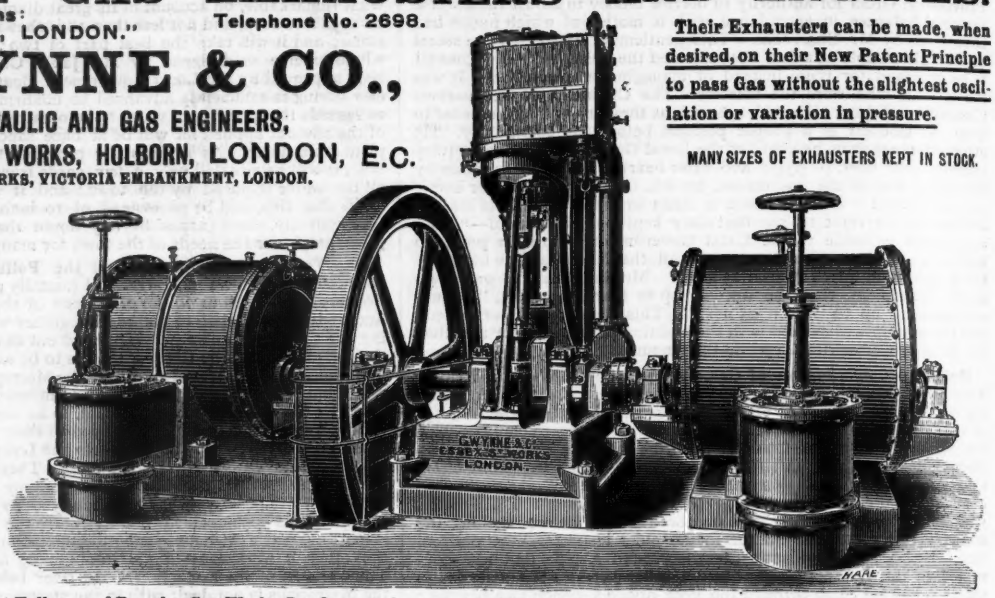
They have completed Exhausters to the extent of 32,000,000 cubic eet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM, PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.



Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.
Catalogues and Testimonials sent on application.

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 951.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegrams: "Volcanism, London."

AMMONIACAL LIQUOR Wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPENT OXIDE Wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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Correspondence invited.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
Please write for Estimate before ordering elsewhere.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
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W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 1011 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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GAS PLANT CEMENT
FOR ALL LEAKAGES.

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HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
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CLERK and Collector, Gas Rental and LEDGER CLERK, MANAGER OF SHOWROOMS, or any position of Trust, Seventeen years' experience. First-class References. Age 32.
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ADVERTISER (age 35) seeks Situation as MANAGER or FOREMAN of Gas-Works Twenty years thorough practical experience. No objection to go abroad. Speaks Spanish, and has excellent testimonials for past management.
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GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality Sample and Price on application.
OXIDE PAINTS, OILS, SULPHURIC ACID, &c
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

BOG ORE.

WE are Importers of a first-class quality of this ORE, and wish to treat with Buyers.
C. E. MULLER AND CO.
Middlesbrough, November, 1894.

AS Secretary and Accountant, or Assistant. Advertiser desires engagement in either capacity. Fifteen years' secretarial experience. Good address. Excellent testimonials as to business qualifications.
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WANTED, a First-class Traveller, to push a Speciality. Must have undoubted connection with Gas Companies. Salary, Commission, and Expenses.
State, by letter, Salary, Experience, Age, and District of connection, to No. 2457, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Fitter, accustomed to Inside and Outside Work—House Fitting, Main and Service Laying, Fixing Meters, Gas-Stoves, &c., and General Repairs on a Gas-Works. Must be a good workman, steady, and reliable.
Apply, stating Age, Experience, and Wages required to E. G. SMITHARD, Gas-Works, CHELMSFORD.
Nov. 24, 1894.

TEN-HORSE Power "Trusty" Gas-ENGINE, by Weyman, FOR SALE. Cost £220 two years ago. Will be sold for half-price, to clear at once. Guaranteed in good working order.
Apply to W. BIRCH, HIGH WYCOMBE.

TO TAR DISTILLERS.

THE Directors of the Shotley Bridge and Consett District Gas Company invite TENDERS for the purchase of the TAR produced at their Works for the Year 1895.
Quantity, about 60,000 gallons.
Contractor to provide Barrels, and accept delivery at Consett and Blackhill Station.
Tenders to be sent to the undersigned not later than Dec. 6.

M. RICHLEY,
Secretary.

Nov. 9, 1894.

RETORTS AND FIRE-BRICKS.

THE Directors of the Rochester, Chat-ham, and Strood Gaslight Company are prepared to receive TENDERS for the supply of about 1500 feet run of CLAY RETORTS, 43,000 FIRE-BRICKS, 200 TILES, and 50 tons of CLAY.
Specification and Form of Tender may be obtained from the undersigned, to whom tenders, endorsed "Retorts, &c.," must be delivered on or before Noon, of Thursday, the 13th of December, 1894.

J. M. VEEVERS,
Engineer and Secretary.

Gas Offices: 58, High Street, Rochester,
Nov. 15, 1894.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor-poration are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 inches to 24 inches in diameter, required during the Twelve Months ending the 31st of December, 1895.
Specification and Form of Tender to be obtained from the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Dec. 8, 1894.
The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Nov. 13, 1894.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas Committee of the above Cor-poration are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.
Specification, Quantities, and Form of Tender can be obtained from the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Dec. 8, 1894.
The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Nov. 13, 1894.

SOUTH METROPOLITAN GAS COMPANY.

SALE BY TENDER OF £25,000 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MINIMUM PRICE £157 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £25,000 of 5 per Cent. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the South Metropolitan Gas Act, 1892.
Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and tenders must be sent in on or before Tuesday, the 18th day of December next.
The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower price than at the rate of £157 money for each £100 Debenture Stock.

By order,
FRANK BUSH, Secretary.

Office: 709A, Old Kent Road, S.E.,
Nov. 16, 1894.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £100,000 3 PER CENT. DEBENTURE STOCK. MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue (being the First portion of the £500,000 DEBENTURE STOCK, created under the East London Water-Works Company's Act of 1894), bearing Interest at 3 per cent. per annum, less income-tax, and redeemable after the expiration of 25 years from the date of issue, subject to six months' notice being given by the Company. Minimum price, par.
Tenders must be delivered at the Company's Offices, St. Helen's Place, Bishopsgate Street, E.C., not later than Eleven a.m., on Thursday, the 13th day of December ensuing.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place,
Bishopsgate Street, E.C.,
Nov. 15, 1894.

NOTICE.

TO GAS ENGINEERS AND OTHERS.

THE undersigned begs to intimate that Messrs. Clapham Bros., Limited, Keighley, Yorkshire, are no longer authorized to Manufacture his CONDENSER and WASHER-SCRUBBERS.
The above-named Gas Apparatus are erected and giving entire satisfaction at the following places: Neath, Lincoln, Sheffield, Ellesmere, Mountain Ash, Malden, Cullingworth, Montreal (Canada), Woodstock (South Africa), Cape Town (South Africa), &c.
These Appliances can now be obtained solely of the undersigned.

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Winchester House, London, E.C.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS,

By

NORTON H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

LONDON:
WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Price 15s., Limp Cloth, the Fourteenth Yearly

ANALYSIS OF THE ACCOUNTS

OF THE

Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1893, or March 31, 1894, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1893.

Compiled and arranged by

ALFRED LASS, F.C.A.

LONDON: WALTER KING, 11, Bolt Court, FLEET STREET.

HARCOURT'S COLOUR TEST.

For Carbon Bisulphide, Sulphuretted Hydrogen, and Carbonic Acid in Coal Gas.

The Materials for the above Tests may be obtained from

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HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-ON-TYNE.

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FIRE-CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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Prices and Analysis of all the Scotch Cannels on Application.

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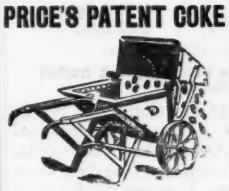

effecting a great saving of time, labour, and expense.
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Prices are Reduced.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

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THE LOTHIAN COAL COMPANY,

LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

HEATHCOTE GAS COAL.

Rich in Illuminating Power & Yield of Gas.
Above the average in Weight & Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR Co., Ld.,

CHESTERFIELD.

THE DRUM

FOR PUMPING AIR, WATER, SEMI-FLUIDS, &c

See Advertisement in last and next issue.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY.

Strongly recommended where EXCESSIVE HEATS have to be maintained

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street, NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Bombay Gas Company, San Paulo Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON, FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

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THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE;
OR
E. FOSTER & CO.,
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UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
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LABOR LESS WORK
In 1895.

ENGINEERS AND MANAGERS

Making preparations to adopt

SELF-ACTING SYSTEMS OF CARBONIZING
In 1895,

are cordially invited to call and inspect our latest Designs of Automatic Coal and Coke Handling and Charging Machinery.

We send skilled Draughtsmen to get Particulars for Detail Plans.

Address:—
NEW CONVEYOR CO., LTD.,
3 & 4, LIME STREET SQUARE, LONDON, E.C.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

PIPES, 2-in. to 8-in. PIPES, 2-in. to 8-in. PIPES.

MONIER-WILLIAMS & Co.
IRONFOUNDERS,
MIDDLESBROUGH.

THORNLEY GAS COALS

WORKED BY THE
WEARDALE IRON AND COAL COMPANY, Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]
TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.
Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your THORNLEY GAS COAL exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, 17 Sperm Candles.
The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

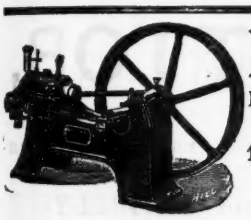
JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

SULPHATE OF AMMONIA SATURATORS.
JOSEPH TAYLOR & CO.,
Central Plumbing Works, Town Hall Square,
BOLTON.
Practical Makers of all kinds of Saturators, and Specialists in every description of Lead Work required in connection with Sulphate Plants.
Special attention to Repairs.
Seven Saturators placed with us the present Year.
HIGHEST REFERENCES ON APPLICATION.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS: "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

Wrought-Iron

And Fittings and Accessories.
LAMBERT BROS., WALSALL,
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.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Because the prices of Monarch Gas-Engines are so low, but if you are wanting, have one on trial, and prove conclusively that they are the best value on the market.
1½-B.H. Power with governors, &c., only £28 10s., less liberal terms. Other sizes to 12-H.P. in proportion. Catalogue of Telephones, Bell Speaking-Tubes, Electric Bells, &c., 4d.
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Every Description of Gas Apparatus.
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FOR LARGE OR SMALL
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PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.
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FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

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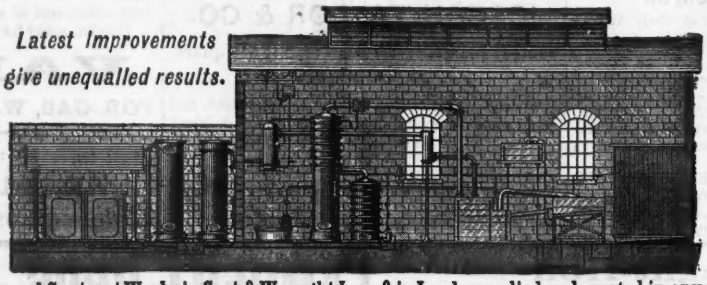

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THE MAXIM CARBURETTOR,

FOR ENRICHING GAS IN BULK.

Used for the last Three Years by all the principal London Gas Companies, and since adopted by numerous Suburban and Provincial Companies and Corporations.

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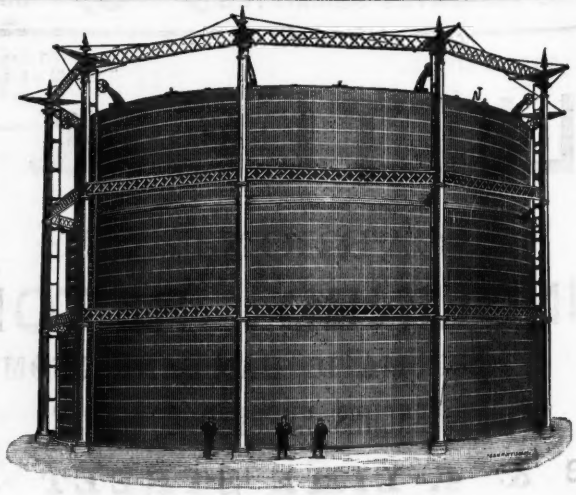

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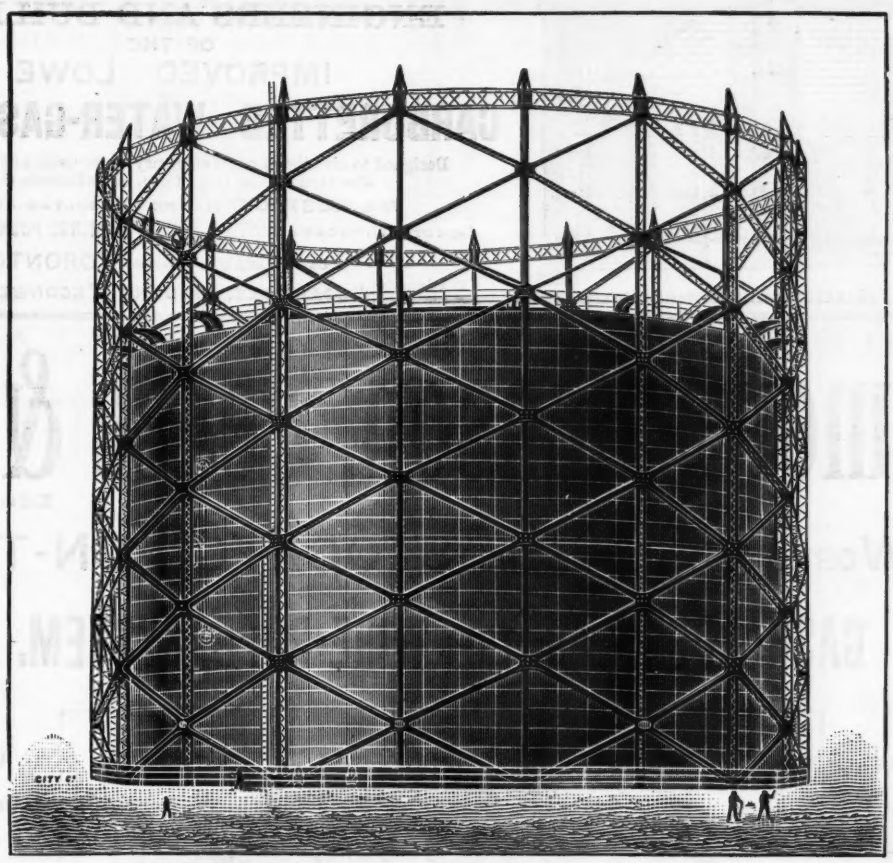

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NEWBIGGING'S "HANDBOOK FOR GAS MANAGERS" (1891 Edition, Page 193), says: "Messrs. S. Cutler and Sons have devised an apparatus for preventing freezing of the water in Gasholder Cups. The arrangement is **Self-Acting, Compact, and Trustworthy.**"

In Use on many of the Principal Gasholders in ENGLAND, GERMANY, AUSTRIA, and UNITED STATES.

Every Telescopic Gasholder should be fitted with this appliance, to avoid the considerable risks arising from the action of Frost.

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L. L. MERRIFIELD, Chief Engineer,
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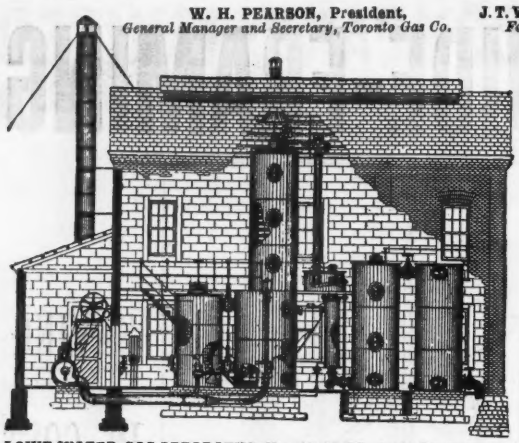

LOWE WATER-GAS APPARATUS, Merrifield-Westcott-Pearson Setting.

THE

Economical Gas Apparatus Construction Co., Ld.

ENGINEERS AND BUILDERS
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CARBURETTED WATER-GAS PLANT

Designed to give the greatest efficiency when using any kind of Oil, Gas-House Coke, Oven Coke, or Anthracite Coal.

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Working at the following places:—

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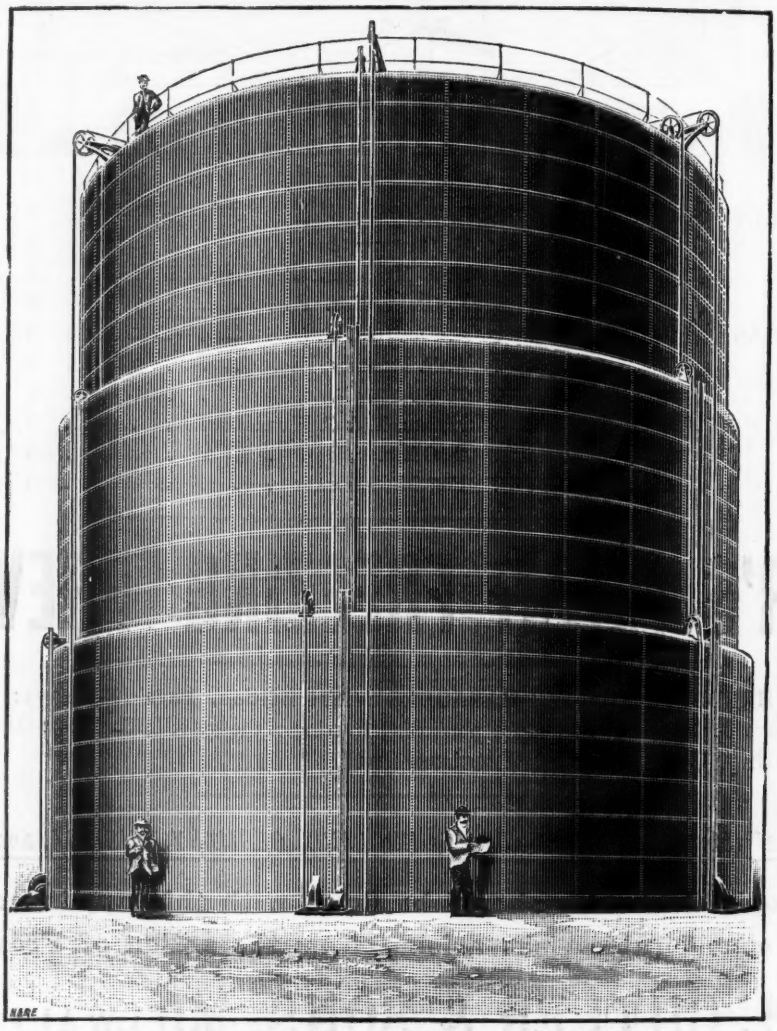

From a Photograph of Three-Lift Holder at Sligo (1894).

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THE DAVIS GAS-STOVE COMPANY, LIMITED

New Heating Stoves for Winter Season, 1894-5.

THE "ALBANY."

With our Improved Non-Lighting Back Silent Duplex Burner.

This exceedingly handsome Stove is fitted with a capacious Heating Chamber of novel construction, so designed that the products of combustion part with the larger portion of their heat before they finally escape by the flue. If necessary, cold *Fresh Air* can be brought in from the outer atmosphere by pipes, and attached to nozzles provided for the purpose at the bottom of the Stove. This air, thoroughly warmed and pure, will then circulate freely in the room. It is decorated with Tiles in side panels and canopy, and presents a very elegant and cheerful appearance.

A great improvement in this fire will be found in our new **Silent Duplex Burner,** fitted with two cocks, so arranged as to permit of the greater number of the jets being turned off, whilst the remainder can be left burning at full power.

With this Burner there is no possibility of lighting back; and with one cock turned full on, the fire presents quite a bright and radiant appearance, with less than half the Gas consumption.

Size: 32 inches high; 25 inches wide; 9 inches deep.

Fire space 11 inches.

PRICE - - £4.

The "COREAN" Condensing Stove.

Fitted with embossed tiles in front, and handsome stained-glass panels in canopy and sides of ornamental design and elegant proportions, this Condensing Stove presents a remarkably artistic appearance. Being entirely constructed, as to the body and working parts, of cast iron, it is practically indestructible. It has a powerful Argand burner, with Governor of latest and best make, and a perforated top panel, through which the air, heated by connection from the condensing tubes, passes into the room.

Consumption 12 feet per hour.

Size: 3 feet high; 21 inches wide; 15 inches deep.

PRICE, best finish, in Berlin Black, **£4 10s.**

The "JAP."

A Condensing Stove of a small, cheap, but very useful type, with encaustic tiles in sides, back, front, and top, and stained glass in canopy. It is constructed with fretwork panels, of ornate pattern, at bottom and top, to promote the circulation of the air in the room around the condensing tubes. It is made of cast iron, would prove very durable, and is especially adapted for use in Offices, Occasional Rooms, Small Halls, &c.

N.B.—All our Condensing Stoves are now manufactured either with copper, majolica, or cast-iron tubes, experience having taught us that sheet iron perishes from the condensation, and is worthless for this purpose.

Size: 2 ft. 10½ in. high; 12 inches square at base.

PRICE . . **£2 5s.**

FACTORY & OFFICES: CAMBERWELL. Show-Rooms: 59, QUEEN VICTORIA STREET

All communications to Camberwell.

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

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CASTINGS OF EVERY DESCRIPTION.

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Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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WEST'S GAS IMPROVEMENT COMPANY, LTD.,

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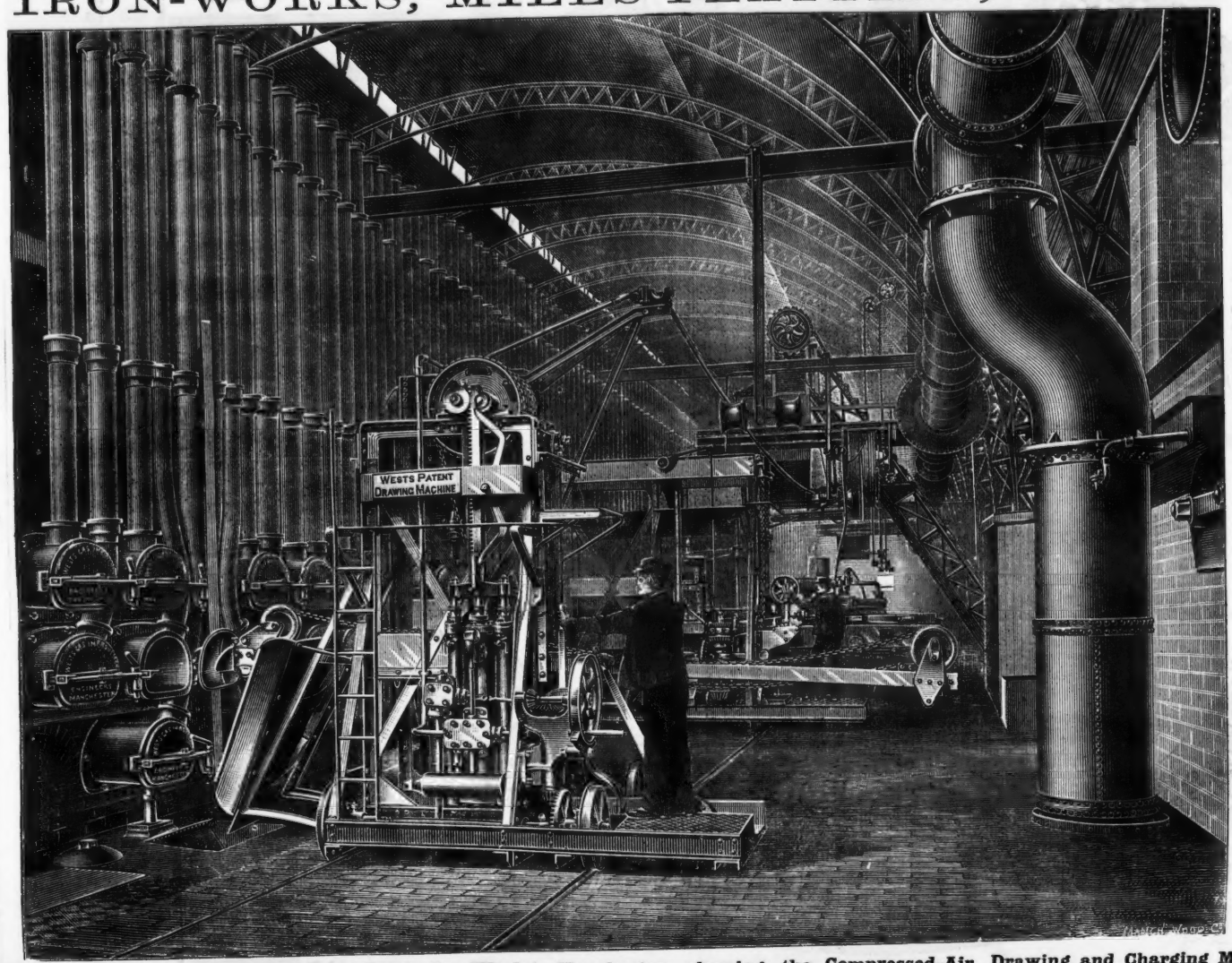
WEST'S MANUAL AND POWER MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.



Interior of Retort-House at the Bradford Road Gas-Works, Manchester, showing the Compressed-Air Drawing and Charging Machines.

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OVER

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LINEAL FEET

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RETORTS DAILY

ARE CHARGED AND DRAWN BY

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The best **KENTUCKY CANNEL** in the Market.

SAMPLE CARGO will demonstrate the extraordinary value of this Coal, and of the resultant Coke and other Bye-Products.

The unlimited quantity and REDUCED PRICE of this Material makes it the most satisfactory and economical Gas Enricher now available.

COKE.—Briefly the "Bear Creek" Cannel produces a first-class Coke—that is, by itself, and unmixed with Coke from Common Coals—merchantable, comparing favourably with Coke from the Standard Gas Coals.

Correspondence solicited. Printed Reports, Analyses, and Samples for Testing sent on application.

For Cargo Prices either c.i.f. or f.o.b. Norfolk or Newport News, Va., or Pensacola, Florida, address

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THE LARGEST GASHOLDER IN THE WORLD

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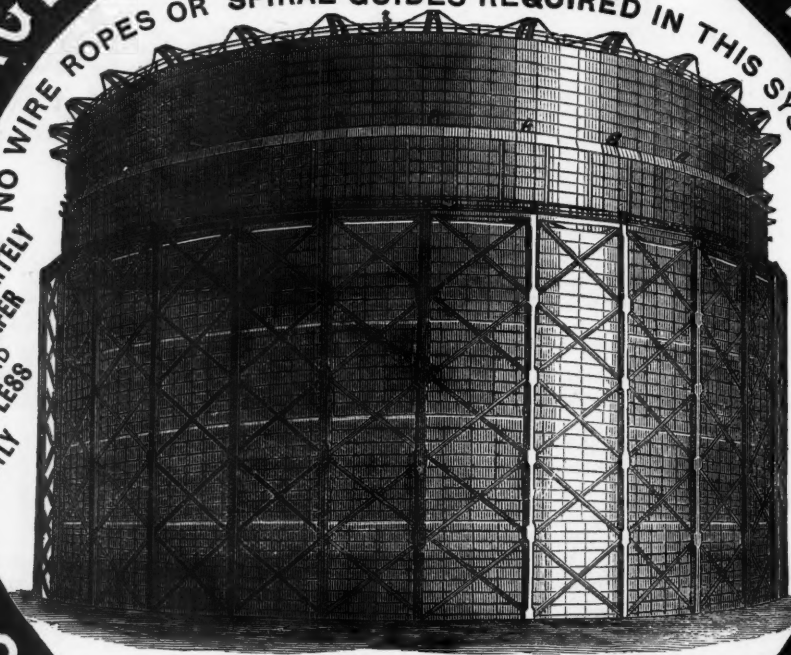
NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



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ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company

IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAR

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Scoops supplied with or without handles, and of any dimensions or shape required.
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ESTABLISHED 1836.

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BEST QUALITY.
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[See Illustrated Advertisement, Nov. 6, p. 895.]

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MANUFACTURERS
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IN GLASS AND METAL.

ARROL-FOULIS
Patent Automatic Machinery
FOR
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GAS-RETORTS.
Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
See Illustrated Advertisement, p. II. Centre of JOURNAL for Oct. 9.

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Contractors for the Erection of Gas-Works Complete,
RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.
N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.
MAIN LAYING IN ALL ITS BRANCHES.
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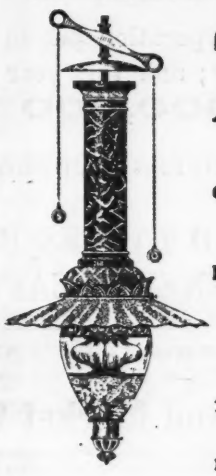
Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.

The Climax of Regenerative Gas Lighting!!



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A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.
HENRY GREENE & SONS,
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PARTICULARS AND PRICES FREE. AGENTS WANTED.

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GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

SERVICE CLEANER.

HUTCHINSON BROTHERS,

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MANUFACTURERS OF IMPROVED

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TEST GASHOLDERS & GENERAL GAS APPARATUS.

BRASS MAIN AND LAMP TAPS.

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The "Falcon" Lamplighter's Torch. Service Cleaners.

SYPHON AND OTHER PUMPS.

Wood and Wrought-Iron Purifier-Grids. Scrubber Boards.

WET AND DRY METERS REPAIRED.

FALCON WORKS, BARNSLEY

Telegrams: "Hutchinson Bros., Barnsley."

LAMP SERVICE CLEANER.

CLAPHAM BROTHERS, LIMITED,

— ESTABLISHED 1837 —

Sole Makers of Laycock and Clapham's

PATENT "ECLIPSE" WASHER-SCRUBBER.

Last year the Manchester Corporation put in an "ECLIPSE" WASHER-SCRUBBER to pass 3,000,000 Cubic Feet per day; and this year have ordered TWO MORE, each to pass 4,000,000 Cubic Feet per day.

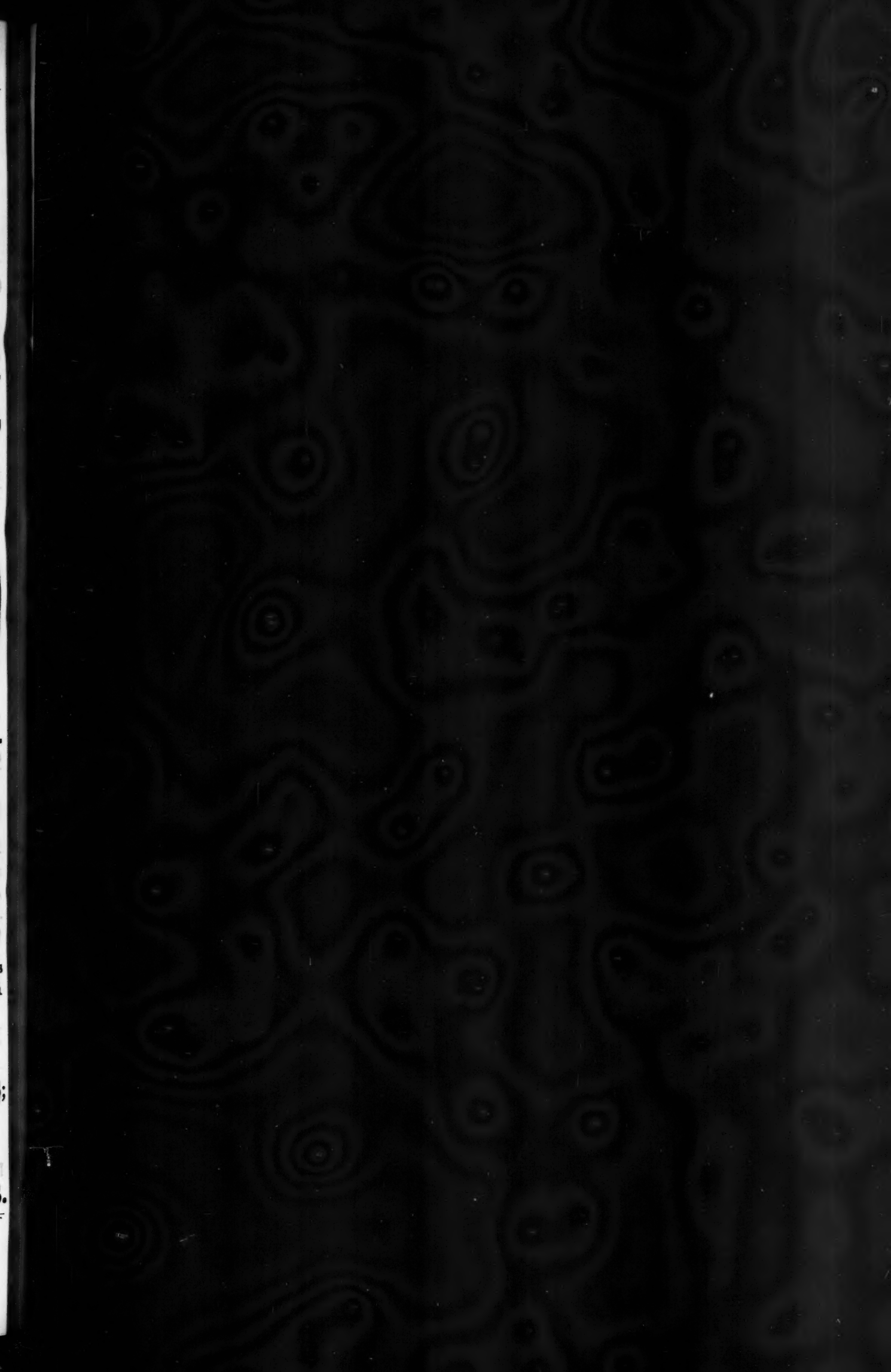
OTHER LARGE REPEAT ORDERS HAVE ALSO BEEN RECEIVED.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS; MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

CATALOGUES AND FULL PARTICULARS ON APPLICATION.

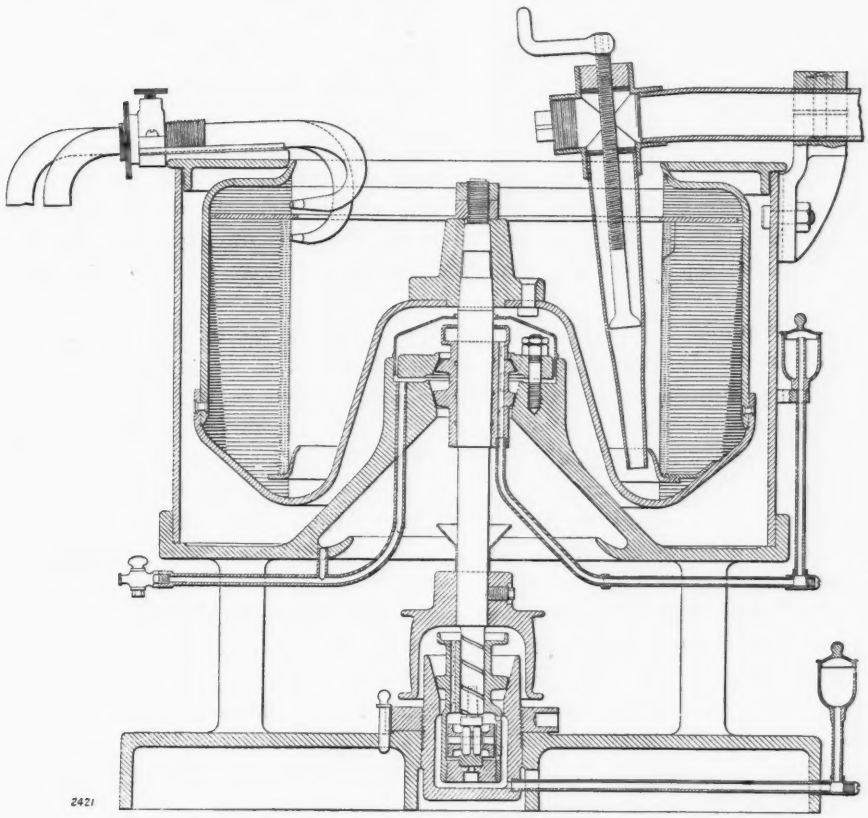
Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

London: Printed by Walter King (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 27, 1894.



CENTRIFUGAL TAR SEPARATOR.

BURMEISTER & WAIN'S PATENT.



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SOLE AGENTS,

2, EXHIBITION BUILDINGS, COPENHAGEN.

Telegraphic Address—"MASKINSALG."

CENTRIFUGAL TAR SEPARATOR.

THIS Tar Separator has now been in practical operation in Berlin and Copenhagen for the past four years, and has been so improved and perfected that we can now claim it to be the *only* successful mechanical Tar Separator in the market.

It extracts the ammonia liquor from the tar so thoroughly that less than 1 per cent. remains behind.

The mechanical arrangements are exceedingly simple, and need not be explained in minute detail. Suffice to say, the Tar Separator is run at a speed of 1800 to 2400 revolutions per minute (according to the viscosity of the tar); the tar is run slowly into the Separator by means of the tube on the right of the engraving. The water-free tar then runs off at the top curved tube, and the ammoniacal liquor is run off at the bottom curved tube.

The power required is about 4 H.P.E. One attendant to see to the centrifuge, and two labourers to fill the barrels, is all the manual labour that is required. The over-all dimensions of the centrifuge are 2 ft. 8 in. in diameter by 2 ft. 9 in. high.

A small amount of steam is also required to warm the tar before passing it through the Separator. Capacity of machine (ordinary load), 2800 gallons per day.

On the commercial aspect we will dwell more fully, and attach hereto a daily balance sheet worked out from *actual practice* (no estimated figures included). From this it will be seen that the prime cost of the machine is very reasonable, the maintenance low, and the actual saving great.

One point, however, which it is almost impossible to put into £ s. d., but which in a large gas works is of great importance, is that the water-free tar has a much readier sale (even at the higher price) than the rough tar. In Copenhagen, manufacturers of waterproof paper, roofing paper, roofing felt, asphalte and black varnish, will now buy only the water-free tar, and cheerfully pay 12½ to 20 per cent. higher price, as they find it a saving to themselves besides improving the quality of their goods. Distillers also will now buy only the water-free tar, as they find the saving in distilling something like 12 per cent.

With the old and slow system of clearing, or rather partially clearing, the tar from water by the gravity method, the tar was on hand for a much longer time in very large quantities and when ready for the market was *not nearly* of such good quality as the spun tar.

The ammoniacal water which was contained in it was wasted, and as can be seen in the attached balance sheet, this is an important item.

We append translation of Testimonial from L. G. Drory, Esq., of the Imperial Continental Gas Association, Berlin, where two of our large size Tar Separators are in use:—

Translation. *Dated February 10th*, 1894, BERLIN.

H. C. PETERSEN & Co., Copenhagen.

In reply to your favour of 5th inst. we beg to inform you that we are also thoroughly satisfied with the second Tar Separator.

We now allow the water-free tar to run direct into a collecting tank, and we work both Separators at the same time.

They work from 6 a.m. to 6 p.m. daily, clear on the average 255 hectolitres (5600 gallons) tar, and of this time three hours has to be deducted for cleaning the Separators.

The cleared tar gives off *no* water, either in the collecting tank or in the full barrels.

Yours faithfully,

(Signed) IMP. CONT. GAS ASSOC.
L. G. DRORY.

COMPARATIVE COST OF WORKING ON OLD AND NEW SYSTEMS.

Dr. **Old Style (One Day = 10 Hours).** *Cr.*

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Labourers ... ... at 3s. 4d.	10 0		2800 gallons tar at 1.77d. per gallon ...		20 16 3½
Tank; Interest on £834 at 5 per cent.	2 2		Ammonia water		
Depreciation on £834 at 5 per cent.	2 2				
Tar wasted in barrels, 5 per cent. of 2800 = 140 gallons at 1.77d. per gallon	1 0 7				
		1 14 11			
To balance...	... ...	19 1 4½			
		20 16 3½			20 16 3½

New Style (One Day = 10 Hours).

One centrifugal attendant	0 3 8		2352 gallons tar (clear) at 2.08d. per gallon	20 7 2	
Two labourers filling barrels	0 6 8		448 gallons (16 per cent. of 2800) ammonia water containing 0.73 lb. per gallon = 327 lb. at 1⅜d. ...	1 17 5	
Expenses: Sulphate of ammonia extraction, 327 lb.	1 0 4				22 4 7
Tank: Interest on £834 at 5 per cent.	0 2 2				
Depreciation on £834 at 5 per cent.	0 2 2				
Plant: Interest on £139 at 5 per cent.	0 0 4.27				
Depreciation on £139 at 5 per cent.	0 0 4.27				
Repairs on £139 at 5 per cent.	0 0 4.27				
Four horse-power effective 8½ hours at 1d. per horse-power hour	0 2 10				
Steam warming	0 2 1				
		2 0 11.8			
To balance...	... ...	20 3 7.2			
		22 4 7			22 4 7

We supply the necessary intermediate pulleys, as these contain a patent safety device for throwing the belt on to the loose pulley, should the speed increase beyond a certain limit.

Price of Separator (mentioned in above Balance Sheet) complete with Intermediate Pulley, f.o.b. London, £85.

We also supply a Separator for Oil Gas Tar.

Full Particulars on Application.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, November 27, 1894.